

# **Washington State Department of Transportation**

## **Request for Information (RFI) ACQ-2013-0801-RFI for NPDES Stormwater Monitoring Analytical Laboratory Services**

**Release Date: August 1, 2013**

All communication between the RFI responders and WSDOT shall be with the RFI Coordinator. The RFI Coordinator is the **SOLE POINT OF CONTACT** at WSDOT for this procurement.

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## ACRONYMS AND ABBREVIATIONS

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%D	percent difference
%Df	percent drift
%R	percent recovery
%RSD	percent relative standard deviation
AES	atomic emission spectrometry
BMP	best management practice
CAS number	Chemical Abstracts Service registry number
CCB	continuing calibration blank
CCV	continuing calibration verification
CF	calibration factor
COC	chain of custody
DI	deionized water
Ecology	Washington State Department of Ecology
EDD	electronic data deliverable
EPA	United States Environmental Protection Agency
FID	flame ionization detector
GC	gas chromatography
GC/MS	gas chromatography/mass spectrometer
HPLC	high-performance liquid chromatography
HPLC/MS	high-performance liquid chromatography/mass spectrometer
HQ	Washington State Department of Transportation Headquarters in Olympia
HRM	<i>Highway Runoff Manual</i>
ICB	initial calibration blank
ICP	inductively coupled plasma
ICP/AES	inductively coupled plasma/atomic emission spectrometry
ICP/MS	inductively coupled plasma/mass spectrometer
ICV	initial calibration verification
ID	identification
LCL	lower control limit
LCS	laboratory control sample
LCSD	laboratory control sample duplicate
MDL	method detection limit
MQO	measurement/method quality objective
MS	matrix spike
MSD	matrix spike duplicate
NELAP	National Environmental Laboratory Accreditation Program
NPDES	National Pollution Discharge Elimination System
PAHs	polycyclic aromatic hydrocarbons
PDF	Portable Document Format
PQL	practical quantitation limit
Program	Stormwater Monitoring Program
PST	Pacific Standard Time
RF	response factor
RFI	Request for Information

RLs	reporting limits (project-specific)
RPD	relative percent difference
QA	quality assurance
QA/QC	quality assurance and quality control
QC	quality control
QAPP	Quality Assurance Project Plan
SOP	standard operating procedure
SDG	sample delivery group
SIM	selective ion monitoring
TAPE	Guidance for Evaluating Emerging Stormwater Treatment Technologies, Technology Assessment Protocol – Ecology
TAT	turn-around time
TPH	total petroleum hydrocarbons
TSS	Total Suspended Solids
UCL	upper control limit
WSDOT	Washington State Department of Transportation

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# REQUEST FOR INFORMATION (RFI):

## WSDOT NPDES Stormwater Monitoring Analytical Laboratory Services

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### 1. INTRODUCTION

#### 1.1 Purpose of the RFI

The Washington Department of Transportation (WSDOT) is exploring optimal alternatives for retention of laboratory services to support the analytical framework of WSDOT's National Pollution Discharge Elimination System (NPDES) Stormwater Monitoring Program (Program). This Request for Information (RFI) invites potentially qualified laboratories to present their technical ability and competitive pricing such that WSDOT can determine a laboratory selection process that ensures future contracted laboratories are fully capable of supporting the analytical framework of the Program in a cost-effective manner.

#### 1.2 Background

WSDOT conducts statewide stormwater monitoring for both NPDES permit compliance and research of best management practices (BMPs). WSDOT's Stormwater Monitoring Program will use data from these projects to address the following goals:

- (a) Produce scientifically credible data that represent discharges from WSDOT's various land uses.
- (b) Provide information that can be used by WSDOT for designing and implementing effective stormwater management strategies for Washington's highways.
- (c) Provide data that can be used to inform WSDOT's *Highway Runoff Manual* (HRM).

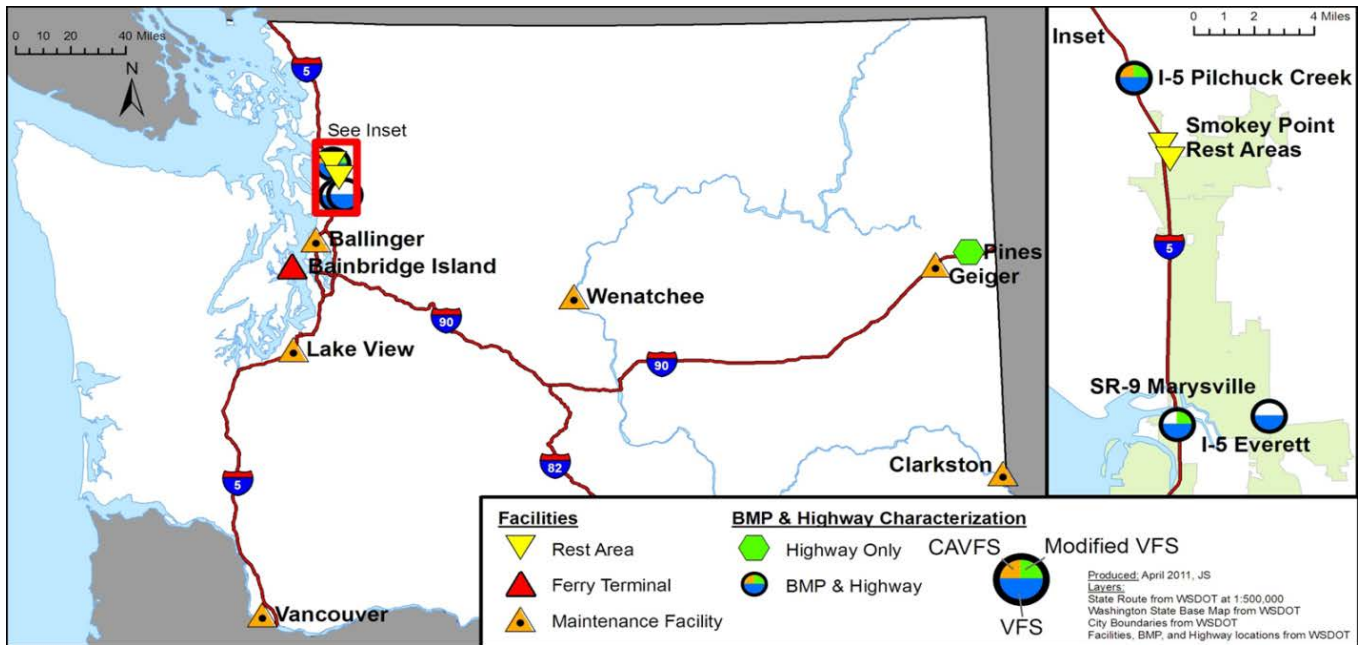
#### 1.3 NPDES Permit

WSDOT was issued a National Pollution Discharge Elimination System and State Waste Discharge Permit for Municipal Stormwater by the Washington State Department of Ecology (Ecology) on February 4, 2009 (Permit # WAR043000A). This is a five-year permit, covering the period from March 6, 2009, to March 6, 2014. Under Special Condition S7 of this permit, WSDOT is directed to implement a monitoring program to establish baseline stormwater runoff information from its highways, rest areas, ferry terminals, and maintenance facilities. Additionally, WSDOT must implement a monitoring program for BMP effectiveness under guidance from Ecology's Technology Assessment Protocol (TAPE) (Guidance for Evaluating Emerging Stormwater Treatment Technologies, Technology Assessment Protocol – Ecology: <http://www.ecy.wa.gov/pubs/0210037.pdf>). See [Figure 1](#) for monitoring site locations.

#### 1.4 BMP Research

The WSDOT is currently researching the benefits of using compost in bioswale BMPs. The compost-amended bioswale has been approved for general use under Ecology's TAPE process. The goal of this research is to assess the long-term benefits of this BMP versus an unamended bioswale. See [Figure 1](#) for monitoring site locations.

**Figure 1 WSDOT's NPDES and BMP Research Stormwater Monitoring Locations.**



## 2. RFI SCHEDULE

<b>Release RFI</b>	August 1, 2013
<b>Vendor Questions Due by 3:00 PM, PST*</b>	August 9, 2013
<b>Responses to Vendor Questions Due by 4:00 PM</b>	August 19, 2013
<b>Vendor Response Submissions Due by 4:00 PM, PST*</b>	August 28, 2013

\*Pacific Standard Time

WSDOT reserves the right to revise the above timeline.

## 3. ADMINISTRATIVE REQUIREMENTS

### 3.1 RFI Coordinator

Vendor communications concerning this RFI should be directed to the RFI Coordinator listed below.

<b>RFI Coordinator</b>	Jolena Missildine
<b>Address</b>	Washington State Department of Transportation Administrative Services Contracts Office P.O. Box 47408 Olympia, WA 98504-7408
<b>Phone</b>	(360) 705-7548
<b>E-mail</b>	<a href="mailto:missildj@wsdot.wa.gov">missildj@wsdot.wa.gov</a>

### 3.2 Response Preparation Instructions

WSDOT requests that vendors respond with any preprinted materials that would provide the information requested.

Vendors are to provide responses in an electronic format such as Adobe Acrobat or Microsoft Word. **All communications must reference the RFI acquisition number ACQ- 2013-0801-RFI in the subject or title area.** This will assist in our review process.

Responses to this RFI should be submitted to the RFI Coordinator no later than 4:00 p.m. August/28, 2013, Pacific Standard Time (PST). Please do not cut and paste your responses into this RFI. Instead, provide your response as a separate document and include numbers referencing the RFI section to which you are responding. Only one electronic copy need be submitted.

Once the RFI response is received, the RFI Coordinator may email an acknowledgement of receipt to the submitting Vendor.

### 3.3 Cost of Response Preparation

Vendors will not be reimbursed for costs associated with preparing or presenting any response to this RFI.

### 3.4 Response Property of WSDOT

All materials submitted in response to this RFI become the property of WSDOT. WSDOT has the right to use any of the ideas presented in any proposal. Selection or rejection of a proposal does not affect this right.

### 3.5 Public Records and Proprietary Information

Any information contained in the response that is proprietary or confidential must be clearly designated. If you mark the entire submission as proprietary or confidential, it will be rejected as non-responsive.

Consistent with [Chapter 42.56 RCW](#), the Public Records Act, WSDOT shall maintain the confidentiality of a Vendor's information marked confidential or proprietary. If a request is made to view a Vendor's proprietary information, WSDOT will notify the Vendor of the request and of the date that the records will be released to the requester unless the Vendor obtains a court order enjoining that disclosure. If the Vendor fails to obtain the court order enjoining disclosure, WSDOT will release the requested information on the date specified.

WSDOT's sole responsibility shall be limited to maintaining the above data in a secure area and to notifying the Vendor of any request(s) for disclosure for so long as WSDOT retains the Vendor's information in WSDOT records per state law. Failure to so label such materials or failure to respond in a timely manner after notice of request for public disclosure has been given shall be deemed a waiver by the Vendor of any claim that such materials are exempt from disclosure.

### 3.6 Vendor Comments and Questions

Vendors may submit comments and questions to the RFI Coordinator prior to responding to the RFI by the date indicated in the RFI schedule in [Section 2](#). Responses to vendor questions will be considered addendums to the RFI. Modifications to the RFI that may result from Vendor comments will be sent to all Vendors. Where there appears to be a conflict between the RFI and any amendments or addenda issued, the last amendment or addendum issued will prevail.

### **3.7 No Obligation**

After a review of the RFI responses and assessment of the marketplace, WSDOT may or may not choose to issue an Acquisition.

Participation in the RFI process is not a requirement for any subsequent competitive procurement, although the results of this RFI may be used to build and refine an Acquisition.

WSDOT reserves the right to refrain from issuing any other formal solicitation document for this product. This RFI is not a formal solicitation and no contract will be awarded as a result.

## **4. SCOPE OF SERVICES**

### **4.1 Laboratory Analyses of Samples**

The laboratories are responsible for performing the analyses of stormwater and sediment samples collected during this monitoring year. The number and type of analyses expected in one monitoring year are summarized in Tables [A-1](#) and [A-2](#). Federal regulation [40 CFR 136](#), Table II, lists allowable field-preservation and sample containers. Tables [A-3](#) and [A-4](#) specify WSDOT's permit-required holding times in relation to sampling locations. Measurement quality objectives (MQOs) are summarized in Tables [A-5](#) and [A-6](#).

### **4.2 Logistics**

WSDOT will make sure there is sufficient stock of various sample containers at the WSDOT Headquarters (HQ) and field offices for conceivable and contingent sampling events. Delivery of sample bottles and return of coolers will consist of courier drop off at prearranged drop-off locations or pick up by WSDOT.

### **4.3 Sampling Supplies, Equipment, and Cleaning**

Upon request by WSDOT, the primary laboratory will provide all sample containers pre-cleaned and certified by qualified manufacturers with appropriate preservatives. WSDOT expects that the primary laboratory or its subcontracted laboratories will perform laboratory-grade cleaning on sampling equipment. Labs will provide disposable sampling equipment such as orthophosphate and metals filters. Additionally, labs will provide deionized (DI) water for field blanks in contaminant-free containers. This water will only be used to conduct blanks testing. The fundamental requirements for cleaning and certification are intended to minimize equipment background concentrations of monitored parameters at levels below the quantitation limits, as specified in Tables [A-5](#) and [A-6](#).

### **4.4 Period of Performance**

WSDOT is expecting to select laboratories to perform analytical services for the period of January 1, 2014, to June 30, 2015.

### **4.5 Expectation of Qualifications**

- (a) WSDOT understands that not all services, methods, or analyses can be performed at one laboratory or one facility. Subcontracting is allowed, although WSDOT prefers minimizing the number of subcontracted laboratories. The primary laboratory is responsible for managing all subcontracted laboratories such that performance of the subcontracted laboratories meets all requirements equivalent to those for the primary laboratory. Network laboratories, under the same company as the primary laboratory, are considered subcontracted laboratories. The

proposal should clearly identify analyses (per sample matrix) to be performed at each of the proposed laboratories. See Tables [B-1](#) and [B-2](#).

- (b) Primary and subcontracted laboratories must be accredited by the National Environmental Laboratory Accreditation Program (NELAP) and the Washington State Department of Ecology Laboratory Accreditation Program for analytical methods to be performed for the Program. If any proposed methods are not certified, identify and provide justification (e.g., not included in accreditation program or method is only accredited by Ecology).
- (c) Ideally, the primary laboratory should be able to perform 90% of the analyses in-house and subcontract those that cannot be performed in-house. This is determined by:

**% of analyses performed in-house =**

$$\frac{(\text{\# of in-house samples}) \times (\text{\# of in-house analytical methods})}{(\text{total \# of samples}) \times (\text{total \# of methods})} \times (100)$$

#### 4.6 Deliverables

- (a) Laboratory deliverables include a laboratory report in PDF format and an electronic data deliverable (EDD) matching the required fields in WSDOT's specified format (see [Appendix D](#) for EDD specifications) per sample delivery group (SDG). An SDG is defined as a set of samples collected for a monitoring site and delivered to the laboratory in the same shipment. WSDOT should be consulted if multiple sample shipments are to be batched into one SDG.
- (b) See [Appendix C](#) for Deliverable definition and specific data package requirements.
- (c) A minimum of Level 2b, as defined in [Appendix C](#), is required for all data reported to the Program. WSDOT may request a Level 3 or 4 data package as needs arise.
- (d) A standard turn-around time (TAT) of 10 business days is required for all analytical work performed in this Program unless otherwise specified. The TAT is defined as the day a sample is received in the laboratory to the day the final deliverable is submitted to WSDOT.

#### 4.7 Pricing

- (a) Complete the tables in [Appendix B – Price Schedules](#); any assumptions and variances should be clearly stated.
- (b) Numbers of analyses presented are based on WSDOT's estimated maximum successful sampling efforts for a representative water year; actual quantities may vary.
- (c) Base pricing on a Level 2b data package, as defined in [Appendix C](#), and identify applicable surcharges for Level 3 and Level 4 data package deliverables.
- (d) For analytical services provided through the [State Master Contract Program](#), laboratory quality control (QC) analyses (i.e., laboratory blanks, laboratory duplicate, matrix spike/matrix spike duplicate, laboratory control sample/laboratory control sample duplicate, and standard reference material) and dilution analyses as a result of sample matrix effects are considered mandatory and are not chargeable as individual samples.
- (e) Field QC samples, such as field duplicates and equipment rinsate blanks, are chargeable as individual samples.
- (f) All sample bottles/containers, packing/shipping materials, and shipment of these supplies to WSDOT are considered part of the analytical cost and are not chargeable as separate items.

(g) Prices are based on a TAT of 10 business days. Identify applicable percent surcharge for 48-hour and five-business-day expedited turn-around time.

(h) If applicable, include price information for the following miscellaneous services:

- Laboratory-grade sampling equipment cleaning prices
- Certified contaminant-free blank water for use during field QC
- Disposable sampling equipment such as orthophosphate and metals filters (pre-cleaned Nalgene 0.45 micron filters)
- EDD development
- Senior chemist consulting services
- Overtime or services conducted outside of normal business hours
- Other work billed per hour

## 5. RFI RESPONSE REQUIREMENTS

All responses should contain the following items.

### 5.1 Statement of Qualifications

- Ability to meet WSDOT's permit-required analytical methods, holding times, and reporting limits.
- Approach to being a primary laboratory that receives all samples and distributes to other laboratories.
- Business days and regular hours of operation.
- Laboratory location and logistical considerations such as courier service, FedEx and UPS delivery options, and acquisition of sample bottles/disposable filters, etc.

### 5.2 Laboratories vs. Analyses to be Performed

Identification of analyses (per sample matrix) to be performed at each of the proposed laboratories.

### 5.3 Detailed Variances, Exceptions, and Explanations

Identification of instances where alternative analytical method(s) are used, or specified reporting limits listed in Tables [A-5](#) and [A-6](#) cannot be achieved.

**Note:** If any proposed methods or services are not certified, identify and provide justification (e.g., not included in accreditation program), where applicable.

### 5.4 Price Schedules

See [Section 4.7](#) for instructions and complete information for [Appendix B](#), Price Schedules.

## APPENDIX A – TABLES

**Table A-1 Estimated maximum number of stormwater samples per year.**

Monitoring Parameter	Field Samples				Field QC Samples		Maximum Annual Total
	Toxicity	Highways	Facilities	BMP	Field Duplicate	Rinsate Blank	
General Chemistry							
Total Chloride	16	70	56	N/A	15	13	170
Total Sulfate	16	N/A	N/A	N/A	2	N/A	18
Alkalinity as CaCO <sub>3</sub>	16	N/A	N/A	N/A	2	N/A	18
Particle Size Distribution (PSD) <sup>[3]</sup>	N/A	N/A	N/A	176	18	16	210
Total Suspended Solids (TSS)	16	70	63	140	29	27	345
Dissolved Organic Carbon (DOC)	16	N/A	N/A	N/A	2	N/A	18
Microbial							
Fecal Coliform	N/A	70	21	N/A	10	8	109
Surfactants							
Methylene Blue Active Substances (MBAS)	16	N/A	49	N/A	7	7	79
Cobalt Thiocyanate Active Substances (CTAS)	16	N/A	N/A	N/A	2	N/A	18
Nutrients							
Nitrate/Nitrite <sup>[1]</sup>	N/A	N/A	56	176	24	24	280
Ortho-phosphate (OP) <sup>[2]</sup>	N/A	70	56	140	27	26	319
Total Kjeldahl Nitrogen (TKN) <sup>[1]</sup>	N/A	N/A	56	176	24	24	280
Total Phosphorus (TP) <sup>[2]</sup>	N/A	70	56	140	27	26	319
Metals							
Dissolved (Cd, Cu, Pb, Zn)	16	70	63	140	29	27	345
Dissolved (Ca, Mg, Na, K)	16	N/A	N/A	N/A	2	N/A	18
Total Recoverable (Cd, Cu, Pb, Zn)	16	70	63	140	29	27	345
Inorganics							
Hardness as CaCO <sub>3</sub>	16	70	63	140	29	27	345
Organics							
Total Petroleum Hydrocarbon (TPH-Diesel) NWTPH-Dx	16	70	63	N/A	15	14	178
Total Petroleum Hydrocarbon (TPH-Gas) NWTPH-Gx	16	70	63	N/A	15	14	178
Herbicides							
Glyphosate (non-aquatic formula) <sup>[4]</sup>	16	70	56	N/A	15	13	170
2,4-D, clopyralid, picloram, triclopyr (total formula) <sup>[4][5]</sup>	N/A	N/A	42	N/A	5	6	53
Dichlobenil <sup>[4]</sup>	N/A	14	42	N/A	6	7	69
Diuron <sup>[4]</sup>	N/A	14	42	N/A	6	7	69
Semi-Volatile Organics							
PAHs <sup>[6]</sup>	16	70	63	N/A	15	14	178

Phthalates <sup>[7]</sup>	16	70	28	N/A	10	7	<b>131</b>
Base/Neutral/Acid extractable semi-volatile compounds (BNAs)- Full list <sup>[8]</sup>	N/A	N/A	N/A	N/A	N/A	5	<b>5</b>

**Table A-1 Notes:**

- [1] Required at all Rest Area sites. Required for Maintenance Facility locations where fertilizers are applied on-site, stored on-site, or applied by vehicles parked on-site. Optionally, sampled at shared BMP and Highways monitoring locations in support of the TAPE approval process.
- [2] Required at all Highway, BMP, and Rest Area sites. Required for Maintenance Facility locations where fertilizers are applied on-site, stored on-site, or applied by vehicles parked on-site.
- [3] Required for shared Highway and BMP monitoring sites for TAPE (Ecology, 2008a) compliance and/or toxicity sampling.
- [4] Required at Highway and Toxicity locations where herbicides listed are applied near the monitoring site vicinity. Required for Maintenance Facility locations where herbicides listed are applied or stored on-site, or applied by vehicles parked on-site.
- [5] WSDOT is required to report only on the ester formula of triclopyr. Triclopyr will be extracted with the other herbicides; however, this method involves hydrolyzing the sample prior to analysis (all forms of triclopyr are transformed into one form). Therefore, more than just the ester formula may be quantified in the result.
- [6] PAHs of interest: acenaphthene, acenaphthylene, anthracene, benzo[a]anthracene, benzo[b]fluoranthene, benzo[k]fluoranthene, benzo[ghi]perylene, benzo[a]pyrene, chrysene, dibenzo[a,h]anthracene, fluoranthene, fluorene, indeno[1,2,3-cd]pyrene, naphthalene, phenanthrene, and pyrene.
- [7] Phthalates of interest: bis(2-Ethylhexyl)phthalate, Butyl benzyl phthalate, Di-n-butyl phthalate, Diethyl phthalate, Dimethyl phthalate, and Di-n-octyl phthalate.
- [8] BNAs will be collected on an as-needed basis and may include but are not limited to: Phenol, Bis(2-Chloroethyl)Ether, 2-Chlorophenol, 1,3-Dichlorobenzene, 1,4-Dichlorobenzene, 1,2-Dichlorobenzene, Benzyl Alcohol, 2-Methylphenol, Bis(2-chloro-1-methylethyl) ether, N-Nitrosodi-n-propylamine, 4-Methylphenol, Hexachloroethane, Nitrobenzene, Isophorone, 2-Nitrophenol, 2,4-Dimethylphenol, Bis(2-Chloroethoxy)Methane, Benzoic Acid, 2,4-Dichlorophenol, 1,2,4-Trichlorobenzene, Naphthalene, 4-Chloroaniline, Hexachlorobutadiene, 4-Chloro-3-Methylphenol, 2-Methylnaphthalene, 1-Methylnaphthalene, Hexachlorocyclopentadiene, 2,4,6-Trichlorophenol, 2,4,5-Trichlorophenol, 2-Chloronaphthalene, 2-Nitroaniline, Dimethyl phthalate, 2,6-Dinitrotoluene, Acenaphthylene, 3-Nitroaniline, Acenaphthene, 2,4-Dinitrophenol, 4-Nitrophenol, Dibenzofuran, 2,4-Dinitrotoluene, Diethyl phthalate, Fluorene, 4-Chlorophenyl-Phenylether, 4-Nitroaniline, 4,6-Dinitro-2-Methylphenol, N-Nitrosodiphenylamine, 1,2-Diphenylhydrazine, Triethyl citrate, 4-Bromophenyl phenyl ether, Hexachlorobenzene, Tris(2-chloroethyl) phosphate (TCEP), Pentachlorophenol, Phenanthrene, Anthracene, Caffeine, 4-nonylphenol, Carbazole, Di-N-Butylphthalate, Triclosan, Fluoranthene, Pyrene, Bisphenol A, Retene, Butyl benzyl phthalate, Benz[a]anthracene, 3,3'-Dichlorobenzidine, Chrysene, Bis(2-Ethylhexyl) Phthalate, Di-N-Octyl Phthalate, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Benzo(a)pyrene, 3B-Coprostanol, Cholesterol, Indeno(1,2,3-cd)pyrene, Dibenzo(a,h)anthracene, Benzo(ghi)perylene.

**Table A-2 Estimated maximum number of sediment samples per year.**

Monitoring Parameter	Field Samples			Field QC Samples		Maximum Annual Total
	Highways	Facilities	BMP	Field Duplicate	Rinsate Blank	
General Chemistry						
Particle Size (grain size)	5	N/A	N/A	1	N/A	6
Total Organic Carbon (TOC)	5	N/A	N/A	1	N/A	6
Total Solids (%) <sup>[5]</sup>	5	N/A	N/A	1	N/A	6
Metals						
Total Recoverable Metals (Cd, Cu, Pb, Zn)	5	N/A	N/A	1	N/A	6
Organics						
Total Petroleum Hydrocarbon (TPH-Diesel) NWTPH-Dx	5	N/A	N/A	1	N/A	6
Herbicides						
Dichlobenil <sup>[1]</sup>	1	N/A	N/A	1	N/A	2
Semi-Volatile Organics						
PAHs <sup>[2]</sup>	5	N/A	N/A	1	N/A	6
Phenolics <sup>[3]</sup>	5	N/A	N/A	1	N/A	6
Phthalates <sup>[4]</sup>	5	N/A	N/A	1	N/A	6

**Table A-2 Notes:**

- [1] Limited to the herbicides listed in the Permit and used within the drainage area by WSDOT.
- [2] PAHs of interest: acenaphthene, acenaphthylene, anthracene, benzo[a]anthracene, benzo[b]fluoranthene, benzo[k]fluoranthene, benzo[ghi]perylene, benzo[a]pyrene, chrysene, dibenzo[a,h]anthracene, fluoranthene, fluorene, indeno[1,2,3-cd]pyrene, naphthalene, phenanthrene, and pyrene.
- [3] Phenolics, including, at a minimum, but not limited to: Phenol, 2-methylphenol, 4-methylphenol, 2,4-dimethylphenol, pentachlorophenol, benzyl alcohol, and benzoic acid.
- [4] Phthalates of interest: bis(2-Ethylhexyl)phthalate, Butyl benzyl phthalate, Di-n-butyl phthalate, Diethyl phthalate, Dimethyl phthalate, and Di-n-octyl phthalate.
- [5] Permit called for "Total Solids," which is an incorrect term for sediment solids analysis. WSDOT believes the Permit intended to ask for "percent solids" analysis.

**Table A-3 Sampling locations and holding time requirements for stormwater samples.**

Monitoring Parameter	Annual Total Samples <sup>[1]</sup>	Sampling Location (County)	Holding Times <sup>[5]</sup>
<b>General Chemistry</b>			
Total Chloride	170	Asotin, Clark, Chelan, King, Pierce, Snohomish, Spokane	28 days
Total Sulfate	18	Snohomish	28 days
Alkalinity as CaCO <sub>3</sub>	18	Snohomish	14 days
Particle Size Distribution (PSD) <sup>[6]</sup>	210	King, Snohomish	7 days
Total Suspended Solids (TSS)	345	Asotin, Clark, Chelan, King, Kitsap, Pierce, Snohomish, Spokane	7 days
Dissolved Organic Carbon (DOC)	18	Snohomish	28 days
<b>Microbial</b>			
Fecal Coliform	109	Kitsap, Snohomish, Spokane	6 hours + 2 hours at the lab
<b>Surfactants</b>			
Methylene Blue Active Substances (MBAS)	79	Asotin, Clark, Chelan, King, Kitsap, Pierce, Snohomish, Spokane	48 hours
Cobalt Thiocyanate Active Substances (CTAS)	18	Snohomish	48 hours
<b>Nutrients</b>			
Nitrate/Nitrite <sup>[7]</sup>	280	Asotin, Clark, Chelan, King, Pierce, Snohomish, Spokane	28 days
Ortho-phosphate (OP) <sup>[8]</sup>	319	Asotin, Clark, Chelan, King, Pierce, Snohomish, Spokane	48 hours
Total Kjeldahl Nitrogen (TKN) <sup>[7]</sup>	280	Asotin, Clark, Chelan, King, Pierce, Snohomish, Spokane	28 days
Total Phosphorus (TP) <sup>[8]</sup>	319	Asotin, Clark, Chelan, King, Pierce, Snohomish, Spokane	28 days
<b>Metals</b>			
Dissolved (Cd, Cu, Pb, Zn)	345	Asotin, Clark, Chelan, King, Kitsap, Pierce, Snohomish, Spokane	6 months
Dissolved (Ca, Mg, Na, K)	18	Snohomish	6 months
Total Recoverable (Cd, Cu, Pb, Zn)	345	Asotin, Clark, Chelan, King, Kitsap, Pierce, Snohomish, Spokane	6 months
<b>Inorganics</b>			
Hardness as CaCO <sub>3</sub>	345	Asotin, Clark, Chelan, King, Kitsap, Pierce, Snohomish, Spokane	6 months
<b>Organics</b>			
Total Petroleum Hydrocarbon (TPH-Diesel) NWTPH-Dx	178	Asotin, Clark, Chelan, King, Kitsap, Pierce, Snohomish, Spokane	14 days to extraction for preserved water; 7 days to extraction for unpreserved water <sup>[9]</sup>
Total Petroleum Hydrocarbon (TPH-Gas) NWTPH-Gx	178	Asotin, Clark, Chelan, King, Kitsap, Pierce, Snohomish, Spokane	14 days to extraction for preserved water; 7 days to extraction for unpreserved water <sup>[9]</sup>

**Table A-3 Sampling locations and holding time requirements for stormwater samples (continued).**

Monitoring Parameter	Annual Total Samples <sup>[1]</sup>	Sampling Location (County)	Holding Times <sup>[5]</sup>
<b>Herbicides</b>			
Glyphosate (non-aquatic formula) <sup>[10]</sup>	170	Asotin, Clark, Chelan, King, Pierce, Snohomish, Spokane	7 days until extraction; 40 days after extraction
2,4-D, clopyralid, picloram, triclopyr (total formula) <sup>[10][11]</sup>	53	Asotin, Clark, Chelan, King, Pierce, Spokane	7 days until extraction; 40 days after extraction
Dichlobenil <sup>[10]</sup>	69	Asotin, Clark, Chelan, King, Pierce, Spokane	7 days until extraction; 40 days after extraction
Diuron <sup>[10]</sup>	69	Asotin, Clark, Chelan, King, Pierce, Spokane	7 days until extraction; 40 days after extraction
<b>Semi-Volatile Organics</b>			
PAHs <sup>[2]</sup>	178	Asotin, Clark, Chelan, King, Kitsap, Pierce, Snohomish, Spokane	7 days until extraction; 40 days after extraction
Phthalates <sup>[3]</sup>	131	Snohomish, Spokane	7 days until extraction; 40 days after extraction
Base/Neutral/Acid extractable semi-volatile compounds (BNAs)- Full list <sup>[4]</sup>	5	Asotin, Clark, Chelan, King, Kitsap, Pierce, Snohomish, Spokane	7 days until extraction, 40 days after extraction

**Table A-3 Notes:**

- [1] Total includes the summation of the maximum number of samples collected for regular sampling and field QC sampling.
- [2] PAHs of interest: acenaphthene, acenaphthylene, anthracene, benzo[a]anthracene, benzo[b]fluoranthene, benzo[k]fluoranthene, benzo[ghi]perylene, benzo[a]pyrene, chrysene, dibenzo[a,h]anthracene, fluoranthene, fluorene, indeno[1,2,3-cd]pyrene, naphthalene, phenanthrene, and pyrene.
- [3] Phthalates of interest: bis(2-Ethylhexyl)phthalate, Butyl benzyl phthalate, Di-n-butyl phthalate, Diethyl phthalate, Dimethyl phthalate, and Di-n-octyl phthalate.
- [4] BNAs will be collected on an as-needed basis and may include but are not limited to: Phenol, Bis(2-Chloroethyl)Ether, 2-Chlorophenol, 1,3-Dichlorobenzene, 1,4-Dichlorobenzene, 1,2-Dichlorobenzene, Benzyl Alcohol, 2-Methylphenol, Bis(2-chloro-1-methylethyl) ether, N-Nitrosodi-n-propylamine, 4-Methylphenol, Hexachloroethane, Nitrobenzene, Isophorone, 2-Nitrophenol, 2,4-Dimethylphenol, Bis(2-Chloroethoxy)Methane, Benzoic Acid, 2,4-Dichlorophenol, 1,2,4-Trichlorobenzene, Naphthalene, 4-Chloroaniline, Hexachlorobutadiene, 4-Chloro-3-Methylphenol, 2-Methylnaphthalene, 1-Methylnaphthalene, Hexachlorocyclopentadiene, 2,4,6-Trichlorophenol, 2,4,5-Trichlorophenol, 2-Chloronaphthalene, 2-Nitroaniline, Dimethyl phthalate, 2,6-Dinitrotoluene, Acenaphthylene, 3-Nitroaniline, Acenaphthene, 2,4-Dinitrophenol, 4-Nitrophenol, Dibenzofuran, 2,4-Dinitrotoluene, Diethyl phthalate, Fluorene, 4-Chlorophenyl-Phenylether, 4-Nitroaniline, 4,6-Dinitro-2-Methylphenol, N-Nitrosodiphenylamine, 1,2-Diphenylhydrazine, Triethyl citrate, 4-Bromophenyl phenyl ether, Hexachlorobenzene, Tris(2-chloroethyl) phosphate(TCEP), Pentachlorophenol, Phenanthrene, Anthracene, Caffeine, 4-nonylphenol, Carbazole, Di-N-Butylphthalate, Triclosan, Fluoranthene, Pyrene, Bisphenol A, Retene, Butyl benzyl phthalate, Benz[a]anthracene, 3,3'-Dichlorobenzidine, Chrysene, Bis(2-Ethylhexyl) Phthalate, Di-N-Octyl Phthalate, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Benzo(a)pyrene, 3B-Coprostanol, Cholesterol, Indeno(1,2,3-cd)pyrene, Dibenz(a,h)anthracene, Benzo(ghi)perylene.
- [5] Holding times per 40 CFR 136, edition 7-1-09, unless noted.
- [6] Required for shared highway and BMP monitoring sites for TAPE (Ecology, 2008a) compliance and/or toxicity sampling.
- [7] Required at all Rest Area sites. Required for Maintenance Facility locations where fertilizers are applied on-site, stored on-site, or applied by vehicles parked on-site. Optionally, sampled at shared BMP and Highways monitoring locations in support of the TAPE approval process.
- [8] Required at all Highway, BMP, and Rest Area sites. Required for Maintenance Facility locations where fertilizers are applied on-site, stored on-site, or applied by vehicles parked on-site.
- [9] Preservation per Ecology, 1997 Publication No. 97-602 Washington State Department of Ecology Method: <http://www.ecy.wa.gov/biblio/97602.html>; USEPA, 1997.
- [10] Required at Highway and Toxicity locations where herbicides listed are applied near the monitoring site vicinity. Required for Maintenance Facility locations where herbicides listed are applied or stored on-site, or applied by vehicles parked on-site.
- [11] WSDOT is required to report only on the ester formula of triclopyr. Triclopyr will be extracted with the other herbicide; however, this method involves hydrolyzing the sample prior to analysis (all forms of Triclopyr are transformed into one form). Therefore, more than just the ester formula may be quantified in the result.

**Table A-4 Sampling location and holding times for sediment samples.**

Monitoring Parameter	Annual Total Samples <sup>[1]</sup>	Sampling Location (County)	Holding Times <sup>[5]</sup>
<b>General Chemistry</b>			
Particle Size (grain size)	6	Spokane, Snohomish	6 months
Total Organic Carbon (TOC)	6	Spokane, Snohomish	28 days; 6 months if frozen <sup>[6]</sup>
Total Solids (%) <sup>[7]</sup>	6	Spokane, Snohomish	7 days; 6 months if frozen <sup>[6]</sup>
<b>Metals</b>			
Total Recoverable (Cd, Cu, Pb, Zn)	6	Spokane, Snohomish	6 months
<b>Organics</b>			
Total Petroleum Hydrocarbon (TPH-Diesel) NWTPH-Dx	6	Spokane, Snohomish	14 days until extraction (1 yr if stored frozen at -18°C); 40 days after extraction <sup>[8]</sup>
<b>Herbicides</b>			
Dichlobenil <sup>[9]</sup>	2	Spokane	14 days until extraction (1 yr if stored frozen at -18°C); 40 days after extraction <sup>[6]</sup>
<b>Semi-Volatile Organics</b>			
PAHs <sup>[2]</sup>	6	Spokane, Snohomish	14 days until extraction (1 yr if stored frozen at -18°C); 40 days after extraction <sup>[6]</sup>
Phenolics <sup>[3]</sup>	6	Spokane, Snohomish	14 days until extraction (1 yr if stored frozen at -18°C); 40 days after extraction <sup>[6]</sup>
Phthalates <sup>[4]</sup>	6	Spokane, Snohomish	14 days until extraction (1 yr if stored frozen at -18°C); 40 days after extraction <sup>[6]</sup>

**Table A-4 Notes:**

- [1] Annual Total Samples includes the summation of the maximum number of samples collected for regular sampling and field QC sampling.
- [2] PAHs of interest: acenaphthene, acenaphthylene, anthracene, benzo[a]anthracene, benzo[b]fluoranthene, benzo[k]fluoranthene, benzo[ghi]perylene, benzo[a]pyrene, chrysene, dibenzo[a,h]anthracene, fluoranthene, fluorene, indeno[1,2,3-cd]pyrene, naphthalene, phenanthrene, and pyrene.
- [3] Phenolics, including, at a minimum, but not limited to: Phenol, 2-methylphenol, 4-methylphenol, 2,4-dimethylphenol, pentachlorophenol, benzyl alcohol, and benzoic acid.
- [4] Phthalates of interest: bis(2-Ethylhexyl)phthalate, Butyl benzyl phthalate, Di-n-butyl phthalate, Diethyl phthalate, Dimethyl phthalate, and Di-n-octyl phthalate.
- [5] Holding times per 40 CFR 136, edition 7-1-09, unless noted.
- [6] Puget Sound Estuary Protocols (USEPA, 1997).
- [7] Permit called for "Total Solids," which is an incorrect term for sediment solids analysis. WSDOT believes the Permit intended to ask for "percent solids" analysis.
- [8] Preservation per Ecology, 1997 Publication No. 97-602 Washington State Department of Ecology Method: <http://www.ecy.wa.gov/biblio/97602.html>; USEPA, 1997.
- [9] Limited to the herbicides listed in the Permit and used within the drainage area by WSDOT.

**Table A-5 Measurement quality objectives for stormwater samples.**

Monitoring Parameter	Analytical Methods <sup>[1]</sup>	Reporting Limit	Lab Duplicate (RPD) <sup>[2]</sup>	MS/MSD (% Rec) <sup>[3]</sup>	MS/MSD (RPD) <sup>[4]</sup>	LCS (% Rec) <sup>[5]</sup>
<b>General Chemistry<sup>[8]</sup></b>						
Total Chloride	USEPA 300.0 Rev. 2.1; USEPA 325.2; SM 4110B	0.2 mg/L	≤20%	75-125	≤20%	90-110
Total Sulfate	USEPA 300.0 Rev. 2.1	0.3 mg/L <sup>[9]</sup>	≤20%	75-125	≤20%	90-110
Alkalinity as CaCO <sub>3</sub>	SM 2320 B-97	5 mg/L <sup>[9]</sup>	≤20%	N/A	N/A	80-120
Particle Size Distribution (PSD) <sup>[6]</sup>	ASTM D3977-97/TAPE; Coulter Counter, Laser diffraction; or SM 2560B	N/A	≤20%	N/A	N/A	N/A
Total Suspended Solids (TSS)	SM 2540D <sup>[7]</sup> ; SM 2540B	1.0 mg/L	≤20%	N/A	N/A	80-120
Dissolved Organic Carbon (DOC)	SM 5310B	1.0 mg/L <sup>[9]</sup>	≤20%	75-125	≤20%	80-120
<b>Microbial</b>						
Fecal Coliform	SM 9222D; SM 9221E	2 min., 2x10 <sup>6</sup> max CFU/100 mL	≤20%	N/A	N/A	N/A
<b>Surfactants<sup>[8]</sup></b>						
Methylene Blue Active Substances (MBAS)	SM 5540C; CHEMetrics Colorimetric	0.025 mg/L	≤35%	67-133	N/A	80-120
Cobalt Thiocyanate Active Substances (CTAS)	SM 5540D	0.05 mg/L <sup>[9]</sup>	≤20%	80-120	≤20%	80-120
<b>Nutrients<sup>[8]</sup></b>						
Nitrate/Nitrite	SM 4500-NO <sub>3</sub> - I; USEPA 353.2; SM 4500-NO <sub>3</sub> -E	0.01 mg/L	≤20%	75-125	≤20%	80-120
Ortho-phosphate (OP)	SM 4500-P G; USEPA 365.1; USEPA 365.3; SM 4500 PE; SM 4500 PF	0.01 mg/L	≤20%	75-125	≤20%	80-120
Total Kjeldahl Nitrogen (TKN)	USEPA 351.2; USEPA 351.1; SM 4500-N org B; SM 4500-N org C; SM 4500-NH <sub>3</sub> D; SM 4500-NH <sub>3</sub> E; SM-4500 NH <sub>3</sub> F, SM-4500 NH <sub>3</sub> G	1.0 mg/L <sup>[9]</sup>	≤20%	75-125	≤20%	90-110
Total Phosphorus (TP)	SM 4500-P F; USEPA 365.3; USEPA 365.4; SM 4500 P E	0.01 mg/L	≤20%	75-125	≤20%	80-120

**Table A-5 Measurement quality objectives for stormwater samples (continued).**

Monitoring Parameter	Analytical Methods <sup>[1]</sup>	Reporting Limit	Lab Duplicate (RPD) <sup>[2]</sup>	MS/MSD (% Rec) <sup>[3]</sup>	MS/MSD (RPD) <sup>[4]</sup>	LCS (% Rec) <sup>[5]</sup>
<b>Metals<sup>[12]</sup></b>						
Dissolved Cadmium (Cd)	<b>USEPA 200.8</b> ; SM 3125	0.1 µg/L	≤20%	75-125	≤20%	85-115
Dissolved Copper (Cu)		0.1 µg/L	≤20%	75-125	≤20%	85-115
Dissolved Lead (Pb)		0.1 µg/L	≤20%	75-125	≤20%	85-115
Dissolved Zinc (Zn)		5.0 µg/L <sup>[9]</sup>	≤20%	75-125	≤20%	85-115
Dissolved Calcium (Ca)	USEPA 200.7 Rev. 4.4	0.025 mg/L <sup>[9]</sup>	≤20%	75-125	≤20%	85-115
Dissolved Magnesium (Mg)		0.025 mg/L <sup>[9]</sup>	≤20%	75-125	≤20%	85-115
Dissolved Sodium (Na)		0.025 mg/L <sup>[9]</sup>	≤20%	75-125	≤20%	85-115
Dissolved Potassium (K)		0.25 mg/L <sup>[9]</sup>	≤20%	75-125	≤20%	85-115
Total Recoverable Cadmium (Cd)	<b>USEPA 200.8</b> ; SM 3125	0.2 µg/L	≤20%	75-125	≤20%	85-115
Total Recoverable Copper (Cu)		0.1 µg/L	≤20%	75-125	≤20%	85-115
Total Recoverable Lead (Pb)		0.1 µg/L	≤20%	75-125	≤20%	85-115
Total Recoverable Zinc (Zn)	<b>USEPA 200.8</b> ; USEPA 200.7; SM 3125	5.0 µg/L	≤20%	75-125	≤20%	85-115
<b>Inorganics<sup>[12]</sup></b>						
Hardness as CaCO <sub>3</sub>	<b>SM 2340B</b> ; EPA 200.7; SM 2340C; SM 3120B	1.0 mg/L	≤20%	75-125	≤20%	85-115
<b>Organics<sup>[8]</sup></b>						
Total Petroleum Hydrocarbon (TPH-Diesel) NWTPH-Dx	<b>NWTPH-Dx – Ecology, 1997 Publication No. 97-602</b> ; USEPA SW-846 method 8015C(B)	0.50 µg/L	≤40%	70-130	≤40%	70-130
Total Petroleum Hydrocarbon (TPH-Gas) NWTPH-Gx	<b>NWTPH-Gx – Ecology, 1997 Publication No. 97-602</b>	0.25 µg/L	≤40%	70-130	≤40%	70-130
<b>Herbicides<sup>[8]</sup></b>						
Glyphosate (non-aquatic formula)	<b>USEPA 547<sup>[14]</sup></b> ; USEPA SW-846 Method 8270D (SIM); USEPA SW-846 8151A	25 µg/L <sup>[10]</sup>	≤30%	70-130	≤30%	70-130
Triclopyr (total formula) <sup>[11]</sup>	<b>USEPA SW-846 Method 8270D (SIM)</b> ; USEPA SW-846 8151A	0.0625 µg/L	≤40%	40-130	≤40%	40-130
2,4-D	<b>USEPA SW-846 Method 8270D (SIM)</b> ; USEPA SW-846 8151A	0.0625 µg/L	≤40%	40-130	≤40%	40-130

**Table A-5 Measurement quality objectives for stormwater samples (continued).**

Monitoring Parameter	Analytical Methods <sup>[1]</sup>	Reporting Limit	Lab Duplicate (RPD) <sup>[2]</sup>	MS/MSD (% Rec) <sup>[3]</sup>	MS/MSD (RPD) <sup>[4]</sup>	LCS (% Rec) <sup>[5]</sup>
Clopyralid	USEPA SW-846 Method 8270D (SIM); USEPA SW-846 8151A	0.0625 µg/L	≤40%	40-130	≤40%	40-130
Picloram	USEPA SW-846 Method 8270D (SIM); USEPA SW-846 8151A	0.0625 µg/L	≤40%	40-130	≤40%	40-130
Diuron	USEPA SW-846 Method 8270D (SIM) different extraction from other herbicides, with confirmation by SW 846 Method 8321B if detected; USEPA SW-846 8151A	0.05 µg/L	≤40%	30-130	≤40%	30-130
Dichlobenil	USEPA SW-846 Method 8270D (SIM) different extraction from other herbicides; USEPA SW-846 8151A	0.033 µg/L	≤40%	34-150 <sup>[13]</sup>	≤40%	44-139
<b>Semi-Volatile Organic Compounds<sup>[8]</sup></b>						
<i>Polycyclic Aromatic Hydrocarbons (PAHs):</i>						
Acenaphthene	USEPA SW-846 Method 8270D (SIM); USEPA SW-846 8310	0.1 µg/L	≤40%	55-97	≤40%	40-112
Acenaphthylene		0.1 µg/L	≤40%	48-103	≤40%	30-126 <sup>[13]</sup>
Anthracene		0.1 µg/L	≤40%	51-113	≤40%	30-127 <sup>[13]</sup>
Benzo[a]anthracene		0.1 µg/L	≤40%	59-137	≤40%	38-147
Benzo[b]fluoranthene		0.1 µg/L	≤40%	53-99	≤40%	42-133
Benzo[k]fluoranthene		0.1 µg/L	≤40%	33-122	≤40%	38-131
Benzo[ghi]perylene		0.1 µg/L	≤40%	38-131	≤40%	30-122 <sup>[13]</sup>
Benzo[a]pyrene		0.1 µg/L	≤40%	42-110	≤40%	30-129 <sup>[13]</sup>
Chrysene		0.1 µg/L	≤40%	51-116	≤40%	37-128
Dibenzo[a,h]anthracene		0.1 µg/L	≤40%	30-129 <sup>[13]</sup>	≤40%	30-134 <sup>[13]</sup>
Fluoranthene		0.1 µg/L	≤40%	60-107	≤40%	42-123
Fluorene		0.1 µg/L	≤40%	50-150	≤40%	50-150
Indeno[1,2,3-cd]pyrene		0.1 µg/L	≤40%	37-135	≤40%	30-129 <sup>[13]</sup>
Naphthalene		0.1 µg/L	≤40%	41-97	≤40%	41-105
Phenanthrene		0.1 µg/L	≤40%	30-105 <sup>[13]</sup>	≤40%	30-105 <sup>[13]</sup>
Pyrene		0.1 µg/L	≤40%	61-118	≤40%	43-131

**Table A-5 Measurement quality objectives for stormwater samples (continued).**

Monitoring Parameter	Analytical Methods <sup>[1]</sup>	Reporting Limit	Lab Duplicate (RPD) <sup>[2]</sup>	MS/MSD (% Rec) <sup>[3]</sup>	MS/MSD (RPD) <sup>[4]</sup>	LCS (% Rec) <sup>[5]</sup>
Phthalates:						
Bis(2-Ethylhexyl)phthalate	USEPA SW-846 Method 8270D (SIM)	1.0 µg/L	≤40%	61-131	≤40%	80-128
Butyl benzyl phthalate		1.0 µg/L	≤40%	80-128	≤40%	30-150 <sup>[13]</sup>
Di-n-butyl phthalate		1.0 µg/L	≤40%	73-148	≤40%	70-150 <sup>[13]</sup>
Diethyl phthalate		1.0 µg/L	≤40%	79-117	≤40%	77-123
Dimethyl phthalate		1.0 µg/L	≤40%	73-126	≤40%	74-122
Di-n-octyl phthalate		1.0 µg/L	≤40%	61-148	≤40%	75-135
Base/Neutral/Acid Extractable Semi-Volatile Compounds (BNAs)-Full List <sup>[15]</sup> :						
Phenol	USEPA SW-846 Method 8270D	0.33 µg/L <sup>[9]</sup>	≤40%	30-100 <sup>[13]</sup>	≤40%	41-100 <sup>[13]</sup>
Bis(2-Chloroethyl)Ether		0.17 ug/L <sup>[9]</sup>	≤40%	65-110	≤40%	65-110
2-Chlorophenol		0.33 µg/L <sup>[9]</sup>	≤40%	46-104	≤40%	66-109
1,3-Dichlorobenzene		0.08 µg/L <sup>[9]</sup>	≤40%	30-100 <sup>[13]</sup>	≤40%	30-100 <sup>[13]</sup>
1,4-Dichlorobenzene		0.08 µg/L <sup>[9]</sup>	≤40%	30-100 <sup>[13]</sup>	≤40%	30-100 <sup>[13]</sup>
1,2-Dichlorobenzene		0.08 µg/L <sup>[9]</sup>	≤40%	30-100 <sup>[13]</sup>	≤40%	30-100 <sup>[13]</sup>
Benzyl Alcohol		0.83 µg/L <sup>[9]</sup>	≤40%	30-100 <sup>[13]</sup>	≤40%	30-100 <sup>[13]</sup>
2-Methylphenol		0.83 µg/L <sup>[9]</sup>	≤40%	30-100 <sup>[13]</sup>	≤40%	55-117
bis(2-chloro-1-methylethyl) ether		0.08 µg/L <sup>[9]</sup>	≤40%	63-105	≤40%	63-105
N-Nitrosodi-n-propylamine		0.08 µg/L <sup>[9]</sup>	≤40%	46-124	≤40%	60-128
4-Methylphenol		0.83 µg/L <sup>[9]</sup>	≤40%	30-100 <sup>[13]</sup>	≤40%	43-127
Hexachloroethane		0.08 µg/L <sup>[9]</sup>	≤40%	30-100 <sup>[13]</sup>	≤40%	30-79 <sup>[13]</sup>
Nitrobenzene		0.08 µg/L <sup>[9]</sup>	≤40%	48-113	≤40%	67-108
Isophorone		0.17 ug/L <sup>[9]</sup>	≤40%	46-100 <sup>[13]</sup>	≤40%	50-103
2-Nitrophenol		0.17 ug/L <sup>[9]</sup>	≤40%	51-115	≤40%	64-115
2,4-Dimethylphenol		0.83 µg/L <sup>[9]</sup>	≤40%	58-122	≤40%	59-127
Bis(2-Chloroethoxy)Methane		0.08 µg/L <sup>[9]</sup>	≤40%	46-124	≤40%	65-116
Benzoic Acid		1.67 µg/L <sup>[9]</sup>	≤40%	30-100 <sup>[13]</sup>	≤40%	30-100 <sup>[13]</sup>
2,4-Dichlorophenol		0.83 µg/L <sup>[9]</sup>	≤40%	49-125	≤40%	66-115
1,2,4-Trichlorobenzene		0.08 µg/L <sup>[9]</sup>	≤40%	30-100 <sup>[13]</sup>	≤40%	30-100 <sup>[13]</sup>
Naphthalene		0.08 µg/L <sup>[9]</sup>	≤40%	34-114	≤40%	34-114
4-Chloroaniline		3.33 µg/L <sup>[9]</sup>	≤40%	30-150 <sup>[13]</sup>	≤40%	30-150 <sup>[13]</sup>
Hexachlorobutadiene		0.08 µg/L <sup>[9]</sup>	≤40%	30-100 <sup>[13]</sup>	≤40%	30-100 <sup>[13]</sup>
4-Chloro-3-Methylphenol		0.83 µg/L <sup>[9]</sup>	≤40%	50-133	≤40%	60-129
2-Methylnaphthalene		0.08 µg/L <sup>[9]</sup>	≤40%	30-112 <sup>[13]</sup>	≤40%	30-112 <sup>[13]</sup>
1-Methylnaphthalene		0.08 µg/L <sup>[9]</sup>	≤40%	33-110	≤40%	33-110
Hexachlorocyclopentadiene		0.33 µg/L <sup>[9]</sup>	≤40%	30-100 <sup>[13]</sup>	≤40%	30-100 <sup>[13]</sup>
2,4,6-Trichlorophenol		0.33 µg/L <sup>[9]</sup>	≤40%	66-118	≤40%	51-141

**Table A-5 Measurement quality objectives for stormwater samples (continued).**

Monitoring Parameter	Analytical Methods <sup>[1]</sup>	Reporting Limit	Lab Duplicate (RPD) <sup>[2]</sup>	MS/MSD (% Rec) <sup>[3]</sup>	MS/MSD (RPD) <sup>[4]</sup>	LCS (% Rec) <sup>[5]</sup>
2,4,5-Trichlorophenol	USEPA SW-846 Method 8270D	0.33 µg/L <sup>[9]</sup>	≤40%	56-130	≤40%	46-141
2-Chloronaphthalene		0.17 µg/L <sup>[9]</sup>	≤40%	30-127 <sup>[13]</sup>	≤40%	30-127 <sup>[13]</sup>
2-Nitroaniline		1.67 µg/L <sup>[9]</sup>	≤40%	30-145 <sup>[13]</sup>	≤40%	64-136
Dimethyl phthalate		0.17 µg/L <sup>[9]</sup>	≤40%	73-126	≤40%	74-122
2,6-Dinitrotoluene		0.33 µg/L <sup>[9]</sup>	≤40%	71-130	≤40%	65-131
Acenaphthylene		0.08 µg/L <sup>[9]</sup>	≤40%	46-118	≤40%	46-118
3-Nitroaniline		0.33 µg/L <sup>[9]</sup>	≤40%	30-123 <sup>[13]</sup>	≤40%	30-150 <sup>[13]</sup>
Acenaphthene		0.08 µg/L <sup>[9]</sup>	≤40%	30-150 <sup>[13]</sup>	≤40%	30-150 <sup>[13]</sup>
2,4-Dinitrophenol		0.83 µg/L <sup>[9]</sup>	≤40%	71-139	≤40%	42-135
4-Nitrophenol		0.83 µg/L <sup>[9]</sup>	≤40%	30-100 <sup>[13]</sup>	≤40%	30-134 <sup>[13]</sup>
Dibenzofuran		0.17 µg/L <sup>[9]</sup>	≤40%	47-126	≤40%	47-126
2,4-Dinitrotoluene		0.33 µg/L <sup>[9]</sup>	≤40%	71-118	≤40%	64-136
Diethyl phthalate		0.17 µg/L <sup>[9]</sup>	≤40%	79-117	≤40%	77-123
Fluorene		0.08 µg/L <sup>[9]</sup>	≤40%	50-134	≤40%	50-134
4-Chlorophenyl-Phenylether		0.08 µg/L <sup>[9]</sup>	≤40%	58-110	≤40%	47-113
4-Nitroaniline		0.33 µg/L <sup>[9]</sup>	≤40%	30-150 <sup>[13]</sup>	≤40%	30-150 <sup>[13]</sup>
4,6-Dinitro-2-Methylphenol		1.67 µg/L <sup>[9]</sup>	≤40%	80-128	≤40%	67-133
N-Nitrosodiphenylamine		0.17 µg/L <sup>[9]</sup>	≤40%	30-150 <sup>[13]</sup>	≤40%	30-150 <sup>[13]</sup>
1,2-Diphenylhydrazine		0.08 µg/L <sup>[9]</sup>	≤40%	50-150	≤40%	50-150
Triethyl citrate		0.33 µg/L <sup>[9]</sup>	≤40%	35-143	≤40%	30-123 <sup>[13]</sup>
4-Bromophenyl phenyl ether		0.17 µg/L <sup>[9]</sup>	≤40%	61-136	≤40%	47-113
Hexachlorobenzene		0.08 µg/L <sup>[9]</sup>	≤40%	52-129	≤40%	53-114
Tris(2-chloroethyl) phosphate (TCEP)		0.08 µg/L <sup>[9]</sup>	≤40%	50-150	≤40%	50-150
Pentachlorophenol		0.08 µg/L <sup>[9]</sup>	≤40%	52-140	≤40%	64-140
Phenanthrene		0.17 µg/L <sup>[8]</sup>	≤40%	63-126	≤40%	63-126
Anthracene		0.17 µg/L <sup>[8]</sup>	≤40%	66-121	≤40%	66-121
Caffeine		0.17 µg/L <sup>[8]</sup>	≤40%	30-100 <sup>[13]</sup>	≤40%	62-114
4-nonylphenol		0.33 µg/L <sup>[8]</sup>	≤40%	30-150 <sup>[13]</sup>	≤40%	77-150 <sup>[13]</sup>
Carbazole		0.17 µg/L <sup>[8]</sup>	≤40%	59-139	≤40%	59-139
Di-N-Butylphthalate		0.08 µg/L <sup>[8]</sup>	≤40%	73-148	≤40%	70-150 <sup>[13]</sup>
Triclosan		0.08 µg/L <sup>[8]</sup>	≤40%	43-150 <sup>[13]</sup>	≤40%	54-126
Fluoranthene		0.17 µg/L <sup>[8]</sup>	≤40%	72-124	≤40%	72-124
Pyrene		0.17 µg/L <sup>[8]</sup>	≤40%	64-140	≤40%	64-140
Bisphenol A		0.33 µg/L <sup>[8]</sup>	≤40%	30-150 <sup>[13]</sup>	≤40%	30-150 <sup>[13]</sup>
Retene		0.17 µg/L <sup>[8]</sup>	≤40%	73-136	≤40%	75-135
Butyl benzyl phthalate		0.33 µg/L <sup>[8]</sup>	≤40%	80-150	≤40%	30-150 <sup>[13]</sup>
Benzo[a]anthracene		0.17 µg/L <sup>[8]</sup>	≤40%	84-130	≤40%	84-130

**Table A-5 Measurement quality objectives for stormwater samples (continued).**

Monitoring Parameter	Analytical Methods <sup>[1]</sup>	Reporting Limit	Lab Duplicate (RPD) <sup>[2]</sup>	MS/MSD (% Rec) <sup>[3]</sup>	MS/MSD (RPD) <sup>[4]</sup>	LCS (% Rec) <sup>[5]</sup>
3,3'-Dichlorobenzidine	USEPA SW-846 Method 8270D	0.17 µg/L <sup>[8]</sup>	≤40%	30-150 <sup>[13]</sup>	≤40%	30-150 <sup>[13]</sup>
Chrysene		0.17 µg/L <sup>[8]</sup>	≤40%	82-128	≤40%	82-128
bis(2-Ethylhexyl) Phthalate		0.17 µg/L <sup>[8]</sup>	≤40%	61-131	≤40%	80-128
Di-N-Octyl Phthalate		0.83 µg/L <sup>[8]</sup>	≤40%	61-148	≤40%	75-135
Benzo(b)fluoranthene		0.08 µg/L <sup>[8]</sup>	≤40%	71-140	≤40%	71-140
Benzo(k)fluoranthene		0.08 µg/L <sup>[8]</sup>	≤40%	73-141	≤40%	73-141
Benzo(a)pyrene		0.08 µg/L <sup>[8]</sup>	≤40%	70-145	≤40%	70-145
3B-Coprostanol		1.67 µg/L <sup>[8]</sup>	≤40%	30-150 <sup>[13]</sup>	≤40%	30-150 <sup>[13]</sup>
Cholesterol		1.67 µg/L <sup>[8]</sup>	≤40%	30-150 <sup>[13]</sup>	≤40%	30-140 <sup>[13]</sup>
Indeno(1,2,3-cd)pyrene		0.08 µg/L <sup>[8]</sup>	≤40%	61-139	≤40%	61-139
Dibenzo(a,h)anthracene		0.08 µg/L <sup>[8]</sup>	≤40%	65-130	≤40%	65-130
Benzo(ghi)perylene		0.17 µg/L <sup>[8]</sup>	≤40%	61-141	≤40%	61-141

**Table A-5 Notes:**

- [1] The methods listed in bold are preferred. However, subsequent methods are equally allowable by WSDOT's NPDES permit. Alternative published methods equivalent to the recommended methods that achieve the listed reporting limits can be accepted.
- [2] Recommended value. The relative percent difference (RPD) must be ≤ the indicated percentage for results that are >5x reporting limit (RL). Concentration difference values must be ≤2x RL for values that are ≤5x RL.
- [3] Recommended value. For inorganics, the *Contract Laboratory Program Functional Guidelines* states that the spike recovery limits do not apply when the sample concentration exceeds the spike concentration by a factor of four or more (USEPA, 2010).
- [4] Recommended value. The matrix spike duplicate RPD criteria apply when original and replicate results are ≥5x RL. Concentration difference of 1x RL applies to precision evaluation if either or both original and replicate results are <5x RL.
- [5] Recommended value.
- [6] Required for shared Highway and BMP monitoring sites for TAPE (Ecology, 2008a) compliance and/or toxicity sampling.
- [7] TAPE (Ecology, 2008a) requires TSS samples not to exceed 500 microns. A US Standard sieve (#35) or equivalent device may be used for sieving at the lab.
- [8] Unless otherwise noted, method quality objectives (matrix spike & LCS values) are based on current performance-based statistics provided by the analytical laboratories. The values are subject to change as the laboratories update their performance control limits as required by the accreditation programs.
- [9] The RL used is based on laboratory recommendations on achievable RLs, and is subject to proposed changes.
- [10] Results for glyphosate analysis between the RL of 25 µg/L and method detection limit (MDL) of 2.5 µg/L will be reported. These results will be qualified as estimates.
- [11] WSDOT is required to report only on the ester formula of triclopyr. Triclopyr will be extracted with the other herbicides; however, this method involves hydrolyzing the sample prior to analysis (all forms of triclopyr are transformed into one form). Therefore, more than just the ester formula may be quantified in the result.
- [12] Method quality objectives (matrix spike & LCS values) are based on *Contract Laboratory Program Functional Guidelines* for inorganic data review (USEPA, 2010).
- [13] The control limit has been adjusted to cope with project-specific accuracy control goals and is based on a recommendation of industry standard. A minimum lower control limit (LCL) of 30%, a minimum upper control limit (UCL) of 100% and a maximum UCL of 150% has been set forth as project accuracy control goals. The control limits have been adjusted accordingly as denoted.
- [14] Method indicated is the actual one used by WSDOT. Other methods were listed for use in WSDOT's municipal permit but may be in error.
- [15] BNAs will be collected on an as-needed basis and may include but are not limited to the below-listed parameters.

**Table A-6 Measurement quality objectives for sediment samples.**

Monitoring Parameter	Analytical Methods <sup>[1]</sup>	Reporting Limit	Lab Duplicate (RPD) <sup>[2]</sup>	MS/MSD (% Rec) <sup>[3]</sup>	MS/MSD (RPD) <sup>[4]</sup>	LCS (% Rec) <sup>[5]</sup>
<b>General Chemistry<sup>[9]</sup></b>						
Particle Size (grain size) <sup>[7]</sup>	ASTM D422; Ecology Method Sieve and Pipette (ASTM 1997); PSEP 1986/2003; ASTM F312-97	N/A	≤20% RSD <sup>[8]</sup>	N/A	N/A	N/A
Total Organic Carbon (TOC)	PSEP <sup>[6]</sup> ; SM 5310 B; SM 5310 C; SM 5310 D; USEPA SW-846 9060A	0.1%	≤20%	75-125	N/A	80-120
Total Solids (%) <sup>[7]</sup>	SM 2540G; SM 2540B	N/A	≤20%	N/A	N/A	N/A
<b>Metals<sup>[10]</sup></b>						
Total Recoverable Cadmium (Cd)	USEPA 200.8; USEPA SW-846 6010C; USEPA SW-846 6020A; SM 3125	0.1 mg/Kg dry	≤20%	75-125	≤20%	85-115
Total Recoverable Copper (Cu)	USEPA 200.8; USEPA SW-846 6010C; USEPA SW-846 6020A; SM 3125	0.1 mg/Kg dry	≤20%	75-125	≤20%	85-115
Total Recoverable Lead (Pb)	USEPA 200.8; USEPA SW-846 6010C; USEPA SW-846 6020A; SM 3125	0.1 mg/Kg dry	≤20%	75-125	≤20%	85-115
Total Recoverable Zinc (Zn)	USEPA 200.8; USEPA 200.7; USEPA SW-846 6010C; USEPA SW-846 6020A; SM 3125	5.0 mg/Kg dry	≤20%	75-125	≤20%	85-115
<b>Organics<sup>[9]</sup></b>						
Total Petroleum Hydrocarbon (TPH-Diesel) NWTPH-Dx	NWTPH-Dx – Ecology, 1997 Publication No. 97-602; USEPA SW-846 method 8015(B)	25.0-100.0 mg/Kg dry	N/A	N/A	N/A	70-130
<b>Herbicides<sup>[9][11]</sup></b>						
Dichlobenil	USEPA SW-846 Method 8270D (SIM); USEPA SW-846 8151A	70 µg/Kg dry <sup>[12]</sup>	N/A	30-140	35%	30-140

**Table A-6 Measurement quality objectives for sediment samples (continued).**

Monitoring Parameter	Analytical Methods <sup>[1]</sup>	Reporting Limit	Lab Duplicate (RPD) <sup>[2]</sup>	MS/MSD (% Rec) <sup>[3]</sup>	MS/MSD (RPD) <sup>[4]</sup>	LCS (% Rec) <sup>[5]</sup>
Semi-Volatile Organic Compounds <sup>[9]</sup>						
Polycyclic Aromatic Hydrocarbons (PAHs):						
Acenaphthene	USEPA SW-846 Method 8270D (SIM)	70 µg/Kg dry	N/A	50-150	40%	50-150
Acenaphthylene		70 µg/Kg dry	N/A	50-150	40%	50-150
Anthracene		70 µg/Kg dry	N/A	50-150	40%	50-150
Benzo[a]anthracene		70 µg/Kg dry	N/A	50-150	40%	50-150
Benzo[a]pyrene		70 µg/Kg dry	N/A	50-150	40%	50-150
Benzo[b]fluoranthene		70 µg/Kg dry	N/A	50-150	40%	50-150
Benzo[ghi]perylene		70 µg/Kg dry	N/A	50-150	40%	50-150
Benzo[k]fluoranthene		70 µg/Kg dry	N/A	50-150	40%	50-150
Chrysene		70 µg/Kg dry	N/A	50-150	40%	50-150
Dibenzo[a,h]anthracene		70 µg/Kg dry	N/A	50-150	40%	50-150
Fluoranthene		70 µg/Kg dry	N/A	50-150	40%	50-150
Fluorene		70 µg/Kg dry	N/A	50-150	40%	50-150
Indeno[1,2,3-cd]pyrene		70 µg/Kg dry	N/A	50-150	40%	50-150
Naphthalene		70 µg/Kg dry	N/A	50-150	40%	50-150
Phenanthrene		70 µg/Kg dry	N/A	50-150	40%	50-150
Pyrene		70 µg/Kg dry	N/A	50-150	40%	50-150
Phenols:						
Phenol	USEPA SW-846 Method 8270D (SIM); PSEP <sup>[6]</sup>	70 µg/Kg dry	N/A	50-150	40%	50-150
Benzyl alcohol		70 µg/Kg dry	N/A	50-150	40%	50-150
2-methylphenol		70 µg/Kg dry	N/A	50-150	40%	50-150

**Table A-6 Measurement quality objectives for sediment samples (continued).**

Monitoring Parameter	Analytical Methods <sup>[1]</sup>	Reporting Limit	Lab Duplicate (RPD) <sup>[2]</sup>	MS/MSD (% Rec) <sup>[3]</sup>	MS/MSD (RPD) <sup>[4]</sup>	LCS (% Rec) <sup>[5]</sup>
4-methylphenol	USEPA SW-846 Method 8270D (SIM); PSEP <sup>[6]</sup>	70 µg/Kg dry	N/A	50-150	40%	50-150
2,4-dimethyphenol		70 µg/Kg dry	N/A	50-150	40%	50-150
pentachlorophenol		70 µg/Kg dry	N/A	50-150	40%	50-150
Benzoic acid		70 µg/Kg dry	N/A	50-150	40%	50-150
Phthalates:						
bis(2-Ethylhexyl)phthalate	USEPA SW-846 Method 8270D (SIM)	70 µg/Kg dry	N/A	50-150	40%	50-150
Butyl benzyl phthalate		70 µg/Kg dry	N/A	50-150	40%	50-150
Di-n-butyl phthalate		70 µg/Kg dry	N/A	50-150	40%	50-150
Diethyl phthalate		70 µg/Kg dry	N/A	50-150	40%	50-150
Dimethyl phthalate		70 µg/Kg dry	N/A	50-150	40%	50-150
Di-n-octyl phthalate		70 µg/Kg dry	N/A	50-150	40%	50-150

**Table A-6 Notes:**

- [1] The methods listed in bold are preferred. However, subsequent listed methods are equally allowable by WSDOT's NPDES permit. Alternative published methods equivalent to the recommended methods that achieve the listed reporting limits can be accepted.
- [2] Recommended value. The relative percent difference (RPD) must be ≤ the indicated percentage for results that are >5x reporting limit (RL). Concentration difference values must be ≤2x RL for values that are ≤5x RL.
- [3] Recommended value. For inorganics, the *Contract Laboratory Program Functional Guidelines* states that the spike recovery limits do not apply when the sample concentration exceeds the spike concentration by a factor of four or more (USEPA, 2010).
- [4] Recommended value. The matrix spike duplicate RPD criteria apply when original and replicate results are ≥5x RL. Concentration difference of 1x RL applies to precision evaluation if either or both original and replicate results are <5x RL.
- [5] Recommended value.
- [6] Method is from the USEPA Puget Sound Estuary Protocols document, *Recommended Guidelines for Measuring Organic Compounds in Puget Sound Water, Sediment and Tissue Samples*. April 1997.
- [7] The measurement quality objectives (MQOs) were taken from the Ecology, 2008b, Sediment Sampling and Analysis Plan Appendix: [www.ecy.wa.gov/pubs/0309043.pdf](http://www.ecy.wa.gov/pubs/0309043.pdf)
- [8] Grain size requires a triplicate analysis; therefore, a relative standard deviation (RSD) is calculated.
- [9] Unless otherwise noted, method quality objectives (matrix spike & LCS values) are based on current performance-based statistics provided by the analytical laboratories. The values are subject to change as the laboratories update their performance control limits as required by the accreditation programs.
- [10] Method quality objectives (matrix spike & LCS values) are based on *Contract Laboratory Program Functional Guidelines* for inorganic data review (USEPA, 2010).
- [11] Dichlobenil, clopyralid, picloram, and triclopyr are the only herbicides required for testing in sediments under the Permit. This list may decrease if the herbicides are not found to be used within the drainage area by WSDOT. This list will be updated annually.
- [12] The RL was not specified in the Permit. The RL used is based on laboratory recommendations on achievable RLs.

## APPENDIX B – PRICE SCHEDULES

**Table B-1 Price schedule for stormwater analyses.**

Monitoring Parameter	Proposed Analytical Methods <sup>[4]</sup>	Laboratory Performing Analysis (Name)	Annual Total Samples	Price per Sample <sup>[5]</sup> (\$)	Price Extension <sup>[6]</sup> (\$)
<b>General Chemistry</b>					
Total Chloride			170		
Total Sulfate			18		
Alkalinity as CaCO <sub>3</sub>			18		
Particle Size Distribution (PSD)			210		
Total Suspended Solids (TSS)			345		
Dissolved Organic Carbon (DOC)			18		
<b>Microbial</b>					
Fecal Coliform			109		
<b>Surfactants</b>					
Methylene Blue Active Substances (MBAS)			79		
Cobalt Thiocyanate Active Substances (CTAS)			18		
<b>Nutrients</b>					
Nitrate/Nitrite			280		
Ortho-phosphate (OP)			319		
Total Kjeldahl Nitrogen (TKN)			280		
Total Phosphorus (TP)			319		
<b>Metals</b>					
Dissolved (Cd, Cu, Pb, Zn)			345		
Dissolved (Ca, Mg, Na, K)			18		
Total Recoverable (Cd, Cu, Pb, Zn)			345		
<b>Inorganics</b>					
Hardness as CaCO <sub>3</sub>			345		
<b>Organics</b>					

Total Petroleum Hydrocarbon (TPH-Diesel) NWTPH-Dx			178		
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**Table B-1 Price schedule for stormwater analyses (continued).**

Monitoring Parameter	Proposed Analytical Methods <sup>[4]</sup>	Laboratory Performing Analysis (Name)	Annual Total Samples	Price per Sample <sup>[5]</sup> (\$)	Price Extension <sup>[6]</sup> (\$)
Total Petroleum Hydrocarbon (TPH-Gas) NWTPH-Gx			178		
<b>Herbicides</b>					
Glyphosate (non-aquatic formula)			170		
2,4-D, clopyralid, picloram, triclopyr (total formula)			53		
Dichlobenil			69		
Diuron			69		
<b>Semi-Volatile Organics</b>					
PAHs <sup>[1]</sup>			178		
Phthalates <sup>[2]</sup>			131		
Base/Neutral/Acid extractable semi-volatile compounds (BNAs)-Full list <sup>[3]</sup>			5		

**Table B-1 Notes:**

- [1] PAHs of interest: acenaphthene, acenaphthylene, anthracene, benzo[a]anthracene, benzo[b]fluoranthene, benzo[k]fluoranthene, benzo[ghi]perylene, benzo[a]pyrene, chrysene, dibenzo[a,h]anthracene, fluoranthene, fluorene, indeno[1,2,3-cd]pyrene, naphthalene, phenanthrene, and pyrene.
- [2] Phthalates of interest: bis(2-Ethylhexyl)phthalate, Butyl benzyl phthalate, Di-n-butyl phthalate, Diethyl phthalate, Dimethyl phthalate, and Di-n-octyl phthalate.
- [3] BNAs will be collected on an as-needed basis and may include, but are not limited to: Phenol, Bis(2-Chloroethyl)Ether, 2-Chlorophenol, 1,3-Dichlorobenzene, 1,4-Dichlorobenzene, 1,2-Dichlorobenzene, Benzyl Alcohol, 2-Methylphenol, Bis(2-chloro-1-methylethyl) ether, N-Nitrosodi-n-propylamine, 4-Methylphenol, Hexachloroethane, Nitrobenzene, Isophorone, 2-Nitrophenol, 2,4-Dimethylphenol, Bis(2-Chloroethoxy)Methane, Benzoic Acid, 2,4-Dichlorophenol, 1,2,4-Trichlorobenzene, Naphthalene, 4-Chloroaniline, Hexachlorobutadiene, 4-Chloro-3-Methylphenol, 2-Methylnaphthalene, 1 Methylnaphthalene, Hexachlorocyclopentadiene, 2,4,6-Trichlorophenol, 2,4,5-Trichlorophenol, 2-Chloronaphthalene, 2-Nitroaniline, Dimethyl phthalate, 2,6-Dinitrotoluene, Acenaphthylene, 3-Nitroaniline, Acenaphthene, 2,4-Dinitrophenol, 4-Nitrophenol, Dibenzofuran, 2,4-Dinitrotoluene, Diethyl phthalate, Fluorene, 4-Chlorophenyl-Phenylether, 4-Nitroaniline, 4,6-Dinitro-2-Methylphenol, N Nitrosodiphenylamine, 1,2-Diphenylhydrazine, Triethyl citrate, 4-Bromophenyl phenyl ether, Hexachlorobenzene, Tris(2-chloroethyl) phosphate(TCEP), Pentachlorophenol, Phenanthrene, Anthracene, Caffeine, 4-nonylphenol, Carbazole, Di-N-Butylphthalate, Triclosan, Fluoranthene, Pyrene, Bisphenol A, Retene, Butyl benzyl phthalate, Benz[a]anthracene, 3,3'-Dichlorobenzidine, Chrysene, Bis(2-Ethylhexyl) Phthalate, Di-N-Octyl Phthalate, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Benzo(a)pyrene, 3B-Coprostanol, Cholesterol, Indeno(1,2,3-cd)pyrene, Dibenzo(a,h)anthracene, Benzo(ghi)perylene.
- [4] Alternative published methods equivalent to the permit-specified methods that achieve the listed reporting limits can be accepted. Primary and subcontracted laboratories must be accredited by the National Environmental Laboratory Accreditation Program (NELAP) and the Washington State Department of Ecology Laboratory Accreditation Program for analytical methods to be performed for the Program. If any proposed methods are not certified, identify and provide justification (e.g., not included in accreditation program or, method is only accredited by Ecology).

[5] Prices listed should be based on a Level 2b deliverable with a 10-business-day turn-around time.

[6] Price Extension in \$ = (Annual Total Samples) x (Price per sample).

**Table B-2 Price schedule for sediment analyses.**

Monitoring Parameter	Proposed Analytical Methods <sup>[4]</sup>	Laboratory Performing Analysis (Name)	Annual Total Samples	Price per Sample <sup>[5]</sup> (\$)	Price Extension <sup>[6]</sup> (\$)
<b>General Chemistry</b>					
Particle Size (grain size)			6		
Total Organic Carbon (TOC)			6		
Total Solids (%)			6		
<b>Metals</b>					
Total Recoverable (Cd, Cu, Pb, Zn)			6		
<b>Organics</b>					
Total Petroleum Hydrocarbon (TPH-Diesel) NWTPH-Dx			6		
<b>Herbicides</b>					
Dichlobenil			2		
<b>Semi-Volatile Organics</b>					
PAHs <sup>[1]</sup>			6		
Phenolics <sup>[2]</sup>			6		
Phthalates <sup>[3]</sup>			6		

**Table B-2 Notes:**

- [1] PAHs of interest: acenaphthene, acenaphthylene, anthracene, benzo[a]anthracene, benzo[b]fluoranthene, benzo[k]fluoranthene, benzo[ghi]perylene, benzo[a]pyrene, chrysene, dibenzo[a,h]anthracene, fluoranthene, fluorene, indeno[1,2,3-cd]pyrene, naphthalene, phenanthrene, and pyrene.
- [2] Phenolics of interest: Phenol, 2-methylphenol, 4-methylphenol, 2,4-dimethylphenol, pentachlorophenol, benzyl alcohol, and benzoic acid.
- [3] Phthalates of interest: bis(2-Ethylhexyl)phthalate, Butyl benzyl phthalate, Di-n-butyl phthalate, Diethyl phthalate, Dimethyl phthalate, and Di-n-octyl phthalate.
- [4] Alternative published methods equivalent to the permit-specified methods that achieve the listed reporting limits can be accepted. Primary and subcontracted laboratories must be accredited by the National Environmental Laboratory Accreditation Program (NELAP) and the Washington State Department of Ecology Laboratory Accreditation Program for analytical methods to be performed for the Program. If any proposed methods are not certified, identify and provide justification (e.g., not included in accreditation program, or method is only accredited by Ecology).
- [5] Prices listed should be based on a Level 2b deliverable with a 10-business-day turn-around time.
- [6] Price Extension in \$ = (Annual Total Samples) x (Price per sample).

**Table B-3 Price schedule for miscellaneous services.**

Analytical Service	Unit Price
<b>Surcharges</b>	
Level 3+4 Deliverable Surcharge	%
48-Hour Turn-Around Time Surcharge	%
Five-Business-Day Turn-Around Time Surcharge	%
<b>Labor Charges</b>	
EDD development	\$ per hour
Senior Chemist Consulting Services	\$ per hour
Sampling equipment cleaning (laboratory grade)	\$ per hour
Overtime or services conducted outside of normal business hours	\$ per hour
Other work billed per hour (please specify)	\$ per hour
<b>Sampling Materials</b>	
Certified contaminant-free blank water for use during field QC sampling	\$
Disposable sampling equipment such as orthophosphate and metals filters (pre-cleaned Nalgene 0.45 micron filters)	\$

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## APPENDIX C – LABORATORY DATA PACKAGE DELIVERABLES LIST

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### 1. Laboratory Data Package Deliverables List

#### A. Introduction

This document presents deliverable requirements for laboratory reports submitted by analytical laboratories in support of the Washington State Department of Transportation (WSDOT) Stormwater Monitoring Program (Program). To ensure all laboratory reports submitted for the Program are legally defensible and technically sound, these requirements have been developed, in general, following United States Environmental Protection Agency (EPA) protocols (EPA 2009, EPA 2010 & 2012) with modifications to be consistent with current industry standard practices. The following sections specify general requirements that apply to each laboratory report and specific reporting parameters required for various types of analytical methodologies (i.e., organic analyses, metals analysis, and conventional chemical parameters).

#### B. General Requirements

The following requirements apply to laboratory reports at all deliverable levels (i.e., levels 2a, 2b, 3, and 4, as defined in EPA 2009; for its purposes, WSDOT has combined EPA levels 3 and 4 into level 3+4):

1. Report must be legible.
2. Submit one laboratory report for one sample delivery group (SDG). In cases where multiple analyses are performed in one SDG, reports for individual analyses should be compiled into one laboratory report before submittal to WSDOT, in the following order, as applicable:
  - a. Semi-volatile organic compounds by SW846 Method 8270D-Full scan (or acceptable analogous method);
  - b. Phthalates by SW846 Method 8270D-Selective Ion Monitoring (SIM) (or acceptable analogous method);
  - c. Polycyclic aromatic hydrocarbons (PAHs) by SW846 Method 8270D-SIM (or acceptable analogous method);
  - d. Phenolics by SW846 Method 8270D-SIM (or acceptable analogous method);
  - e. Herbicides by SW846 Method 8270D-SIM (or acceptable analogous method);
  - f. Glyphosate by EPA Method 547-SIM (or acceptable analogous method);
  - g. Total petroleum hydrocarbon (TPH)-Gasoline by Method NWTPH-Gx (Washington State Department of Ecology [Ecology], 1997 Publication No. 97-602) (or acceptable analogous method);
  - h. TPH-Diesel by Method NWTPH-Dx (Ecology, 1997 Publication No. 97-602) (or acceptable analogous method);
  - i. Total and dissolved metals by EPA Methods 200.8 & 200.7 (or acceptable analogous method);

- j. Hardness as  $\text{CaCO}_3$  by Standard Method 2340B (or acceptable analogous method);
  - k. Conventional chemical parameters by EPA Methods 300.0 Rev. 2.1 (1993), 351.2, and PSEP (USEPA, 1997); Standard Methods 2320 B-97, 2540G, 2540D, 4500H<sup>+</sup>B, 4500-PG, 4500-PF, 4500-NO<sub>3</sub><sup>-</sup>I, 5540C, 5540D, 9221E, 9222D; ASTM D422, E1192-97; and Laser Diffraction (or acceptable analogous methods).
- 3. Include a cover page signed and dated by the laboratory Director, the laboratory Quality Assurance (QA) Officer, or his/her designee to certify the eligibility of the reported contents and the conformance with applicable analytical methodology.
  - 4. Include definitions of abbreviations, data flags, and data qualifiers used in the report.
  - 5. The laboratory is expected to meet the project-specific reporting limits (RLs) (reporting limits are specified in the Program's Quality Assurance Project Plan (QAPP) or laboratory contract) or describe in the case narrative the reason the reporting limits could not be achieved. Laboratory reports should include the following reporting limits:
    - a. The practical quantitation limit (PQL) based on the lowest validated standard in calibration curve for each result. Report the PQL in the electronic file in the "Practical\_quantitation\_limit" column.
    - b. The method detection limit (MDL) for each analyte that has a MDL.
  - 6. Note in the case narrative any modifications to the laboratory standard operating procedures (SOPs) for the method analysis, quality assurance and quality control (QA/QC) activities performed, and results specific to the analysis performed.
  - 7. Include in the sample identification (ID):
    - a. Provide the WSDOT Field ID and Lab ID (and Subcontract ID, if applicable) associated with all sample results, as appropriate.
    - b. Provide the lab's internal sample ID associated with all results OR a table that cross-references results with the laboratory's internal sample ID.
    - c. Clearly identify QC samples and results to include: blanks, lab control samples, surrogates and internal standards, lab duplicates, and matrix spike (MS) and matrix spike duplicates (MSD). If QC samples are reanalyzed, these results need to be clearly identified as such.
  - 8. Include in the sample results:
    - a. Required: Lab name, analytical method, matrix, sample weight/volume or weight/weight with units, project name, SDG number, WSDOT sample ID, lab sample ID, date received, date analyzed, concentration units, and comments.
      - i. For each result: Analyte Chemical Abstracts Service registry number (CAS number) (unless no CAS number exists), analyte name, concentration or other applicable measure, and data flags where applicable.
    - b. If applicable: % solids, date extracted.

9. Include in the QC analyses:
- a. Laboratory control sample (LCS) and LCS duplicate (LCSD) (if matrix spike duplicate analysis is not performed on a WSDOT sample) results, including spiking concentration, spiked results, percent recovery (%R), relative percent difference (RPD), and laboratory acceptance criteria for %R and RPD.
  - b. MS and results, including parent sample concentration, spiking concentration, spiked results, %R, RPD, and laboratory acceptance criteria for %R and RPD. In cases where MS/MSD analyses were not performed on a project sample, LCS/LCSD analyses should be performed and reported instead.
  - c. Laboratory duplicate results, including parent sample concentration, duplicate result, RPD, and laboratory acceptance criteria for RPD.
  - d. Provide results of certified reference material using the same units as for the samples. Provide certificate for certified reference materials.
  - e. Provide results of method blanks.
    - i. If a target analyte is detected in a method blank, all associated sample results should be flagged with "B."
    - ii. If laboratory contamination is identified as the result of a high method blank measurement, the source of contamination and corrective actions taken to prevent future contamination should be noted in the case narrative. If the source is identified after the report is issued, the report should be re-issued or a memo indicating the source and corrective actions should be provided to WSDOT.
    - iii. Clearly identify samples associated with each method blank.
10. Include the completed chain of custody (COC) document, signed and dated by parties who are acquiring and receiving samples. Format may be in hard copy or Portable Document Format (PDF).
11. Include the completed sample receipt document with record of cooler temperature and sample conditions upon receipt at the laboratory. Anomalies such as inadequate sample preservation, inconsistent bottle counts, sample container breakage, a communication record, and corrective actions in response to the anomalies should be documented and incorporated in the sample receipt document. The document should be initialed and dated by personnel who complete the sample receipt document.
- a. Use of a checklist with checks related to sample condition/integrity as well as a comment section to document anomalies and corrective actions is ideal.
  - b. As a minimum requirement, this can be done on the COC form, as long as anomalies are clearly documented and writings are legible; if no anomalies are identified, a conclusion statement (as simple as "Samples ALL OK") is warranted.

12. Include a case narrative that addresses any anomalies or QC outliers in relation to sample receiving, preparation, and analysis on samples in the SDG. The narrative should be presented separately for each analytical method and each sample matrix in the same order as listed in Item 1.
13. Number all pages in the report. Any insertion of pages after the laboratory report is issued should be paginated with the starting page number suffixed with letters (e.g., pages inserted between pages 134 and 135 should be numbered 134A, 134B, etc.).
14. Submit any resubmitted or revised report pages to WSDOT with a cover page stating the reason(s) and scope of resubmission or revision, and signed by the laboratory director, QA Officer, or the designee.

### **C. Requirements for Organic Compound Analyses**

The following specifies information to be tabulated and reported for analyses of organic compounds, including gas chromatography (GC) coping with flame ionization detector (FID) or mass spectrometer (GC/MS) or atomic emission spectrometer (AES), and high-performance liquid chromatography (HPLC) coping with ultraviolet detector or mass spectrometer (HPLC/MS).

1. Sample results (each sample) – GC Column ID, cleanup methods used, initial sample volume or weight, final extract volume, extraction methods, injection volume, dilution factor, and concentration units.
2. Instrument run log – The run log should list, in chronological order, all analytical runs on field samples, QC samples, calibrations, and calibration verification analyses in the SDG with data file name (and/or legible laboratory codes) and analysis date/time for each analytical run.
3. Original sample preparation and analyst worksheet – Initialed and dated by analyst and reviewer.
4. GC/MS or HPLC/MS tune report – Including ion abundance ratios and criteria for all required ions.
5. Initial calibration summary – Including data file name for each calibration standard file; response factor (RF) or calibration factor (CF) for each calibration standard, and each target and surrogate compound; and average RF or CF, percent relative standard deviation (%RSD), correlation coefficient, or coefficient of determination for each target compound and surrogate compounds.
6. Calibration verification summary – Including true amount, calculated amount, and percent difference (%D), or percent drift (%Df), as applicable, for all target compounds.
7. Surrogate spike results with laboratory acceptance criteria for %R.
8. Internal standard (as applicable) results – Internal standard responses are added in field samples, QC analyses, and associated calibration verification analyses.
9. All instrument printouts and raw data – Including quantitation report, GC or HPLC chromatograms, and ion spectra for the analyses of field samples, QC samples, initial calibrations, calibration verification, and mass spectrometer tuning.

Refer to EPA 2012 for specific information to be reported in each item. If required information is not reported in tabulated forms, the information should be organized and sufficient for data validation. Refer to [Table C-1](#) for items required for each validation package by validation level.

**Table C-1 Items required for Organic Compound Analyses by validation package requested.**

Validation Level Requested	General Requirements – Required Items	Organic Compound Analysis – Required Items
Level 2a	All	Items 1, 2, 3, 7, and 8
Level 2b	All	All except Item 9
Level 3+4	All	All

#### **D. Requirements for Metals Analyses**

The following requirements apply to metals analyses by inductively coupled plasma (ICP) coping with mass spectrometer (ICP/MS) or atomic emission spectrometry (ICP/AES) methodology.

1. Dissolved metals samples – Indicate if sample was digested.
2. Instrument run log – The run log should list, in chronological order, all analytical runs on field samples, QC samples, calibrations, and calibration verification analyses in the SDG with analysis date/time for each analytical run.
3. Original sample preparation and analyst worksheet – Initialed and dated by analyst and reviewer.
4. ICP/MS tune report – Including mass spectrometer stability check and resolution check results.
5. Initial calibration summary – Including results for all target analytes for each calibration standard and linear regression correlation coefficients for all target analytes.
6. Initial and continuing calibration verification (ICVs and CCVs) summary – Including true values, result values, and %R for all target analytes. The ICV/CCVs should be properly identified (or numbered) to be sufficiently related to in the run log.
7. Preparation blanks – Initial and continuing calibration blank (ICB/CCB) results. Each ICB and CCB should be properly identified (or numbered) to be sufficiently related to in the run log.
8. ICP inter-element interference check sample results – Including true values, result values, and %R values for proper interferents and target analytes in solution A and solution AB.
9. Internal standard responses for each internal standard in field samples, QC analyses, and associated calibration blank.
10. All instrument printouts and raw data for the analyses of field samples, QC samples, initial calibrations, calibration verifications, and ICP/MS tuning.

Refer to EPA 2010 for specific information to be reported in each item. If required information could not be reported in tabulated forms, the information should be organized and sufficient for data validation. Refer to [Table C-2](#) for items required for each validation package by validation level.

**Table C-2 Items required for Metals Analyses by package requested.**

Validation Level Requested	General Requirements – Required Items	Metals Analysis – Required Items
Level 2a	All	Items 1, 2, 3, 7 (preparation blank only), and 8
Level 2b	All	All except Item 10
Level 3+4	All	All

**E. Requirements for Conventional Chemistry Parameters Analyses**

The following requirements apply to the analyses of conventional chemical parameters (total suspended solids, nitrate/nitrite, total chloride, total sulfate, total phosphorus, ortho-phosphate, total Kjeldahl nitrogen, total organic carbon, dissolved organic carbon, methylene blue active substances, cobalt thiocyanate active substances, etc.):

1. Instrument run log – The run log should list, in chronological order, all analytical runs on field samples, QC samples, calibrations, and calibration verification analyses in the SDG with analysis date/time for each analytical run.
2. Original sample preparation and analyst worksheet – Initialed and dated by analyst and reviewer.
3. Initial calibration summary (as applicable) – Including results for all target analytes for each calibration standard and linear regression correlation coefficients for all target analytes.
4. Initial and continuing calibration verification (ICV and CCV) summary (as applicable) – Including true values, result values, and %R for all target analytes. The ICVs/CCVs should be properly identified (or numbered) to be sufficiently related to in the run log.
5. Preparation blanks – Initial and continuing calibration blank (ICB/CCB) results (as applicable). Each ICB and CCB should be properly identified (or numbered) to be sufficiently related to in the run log.
6. All instrument printouts and raw data for the analyses of field samples, QC samples, initial calibrations, calibration verifications, and analyst notebook.

Refer to EPA 2010 for specific information to be reported in each item. If required information could not be reported in tabulated forms, the information should be organized and sufficient for data validation. Refer to [Table C-3](#) for items required for each validation package by validation level.

**Table C-3 Items required for Conventional Chemistry Parameters Analyses by package requested.**

Validation Level Requested	General Requirements – Required Items	Conventional Analysis – Required Items
Level 2a	All	Items 1, 2, and 5 (preparation blank only)
Level 2b	All	All except Item 6
Level 3+4	All	All

## F. References

United States Environmental Protection Agency (EPA). 1997. Puget Sound Estuary Protocols; *Recommended Guidelines for Measuring Organic Compounds in Puget Sound Water, Sediment and Tissue Samples*. April 1997.

\_\_\_\_\_. 2009. *Guidance for Labeling Externally Validated Laboratory Analytical Data for Superfund Use*, EPA 540-R-08-005. January 13, 2009.

\_\_\_\_\_. 2010. *Contract Laboratory Program Statement of Work for Inorganic Superfund Methods (Multi-Media, Multi-Concentration)*, ISM01.2. January 2010.

\_\_\_\_\_. 2012. *Contract Laboratory Program Statement of Work for Organic Superfund Methods (Multi-Media, Multi-Concentration)*, SOM02.X. November 2012 Draft.

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## APPENDIX D – ELECTRONIC DATA DELIVERABLE (EDD) SPECIFICATION

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### 1. Introduction

Electronic results must be submitted in the format specified below. Tables D-3 through D-5 represent the specifications for each field in the EDD. Data must be entered following these specifications into an Excel compatible format.

### 2. Format Information

Format Name: WSDOT\_SWv1\*

Format Version: 1.0

Based on EPAR2 Format Version: 2.02.47

\*This format is still under revision; therefore, some minor changes may be made as the database is developed.

**Table D-1 Cell color coding.**

Required for entry
Conditionally required for entry
Optional

**Table D-2 Table descriptions.**

Table	Table Name	Purpose
A-3	WSDOTSMP_v1	Entering sample information, labs are required to use this to add QC samples. Field sample data will be entered by WSDOT.
A-4	WSDOTTRSQC_v1	Entering result information
A-5	WSDOTBAT_v1	Entering batch information. This sheet links the samples together in a batch. Data is the same as TRSQC_v1 sheet except test_batch_type and test_batch_id, which link the samples and QC together.

**Table D-3 WSDOTSMP\_v1.**

Field Name	Data Type	Key	Default	Comment	Laboratory Notes	Required?
data_provider	Text(20)	Y		The organization that is submitting data.		Yes
Storm forecast ID	Text(40)	Y	Unknown	Unique ID for Storm forecast.	Use default value = "Unknown" for lab-created samples	Use Specified Value
sys_sample_code	Text(40)	PK		Unique sample identifier. Each sample at a facility must have a unique value, including spikes and duplicates. You have considerable flexibility in the methods used to derive and assign unique sample identifiers, but uniqueness throughout the database is the only restriction enforced by EQUIS®.	sample ID	Yes
sample_name	Text(30)			Additional sample identification information as necessary. Is not required to be unique (i.e., duplicates are OK).		Optional
sample_matrix_code	Text(3)	Y		Code that distinguishes between different types of sample matrix. For example, soil samples must be distinguished from groundwater samples, etc. See the matrix valid values table for valid codes.	"WTR" or "SED"	Yes
sample_type_code	Text(3)	Y		Code which distinguishes between different types of samples. For example, normal field samples must be distinguished from laboratory method blank samples, etc. Use sample_type valid values table.		
sample_source	Text(10)	Y	FIELD	This field identifies where the sample came from: either Field or Lab.	will always = "Lab" for lab-created samples	Use Specified Value

**Table D-3 WSDOTSMP\_v1 (continued).**

Field Name	Data Type	Key	Default	Comment	Laboratory Notes	Required?
parent_sample_code	Text(40)			The value of "sys_sample_code" that uniquely identifies the sample that was the source of this sample. For example, the value of this field for a duplicate sample would identify the normal sample of which this sample is a duplicate.	Required if the sample has a parent sample such as a matrix spike or laboratory duplicate, the parent sample must exist in the EQUIS database (i.e., cannot be a sample from another project)	Conditionally Required
sample_Start_date	Date Time	Y		Date and time sample was collected or made (in "MM/DD/YYYY HH:MM:SS" format for EDD).	Enter the date the sample was created or used; a default time of "12:00" may be used	Yes
sampling_company_code	Text(10)	Y		Name or initials of sampling company (not controlled vocabulary).	Make the same as the data_provider_code	Yes
composite_yn	Text(1)	Y	N	Is sample a composite sample? "Y" for yes or "N" for no.	Use default value = "N" for lab-created samples	Use Specified Value
comment	Text (255)			Comments or observations during sampling event.		Optional

**Table D-4 WSDOTTRSQC\_v1.**

Field Name	Data Type	Key	Default	Comment	Laboratory Notes	Required?
sys_sample_code	Text(40)	PK		Unique sample identifier. Each sample at a facility must have a unique value, including spikes and duplicates. You have considerable flexibility in the methods used to derive and assign unique sample identifiers, but uniqueness throughout the database is the only restriction enforced by EQuIS®.	Field ID supplied by WSDOT or sample ID added using WSDOTSMP_v1 sheet	Yes
lab_anl_method_name	Text(35)	PK	Unknown	Laboratory analytical method name or description. A controlled vocabulary column, valid values can be found in the appendix in table lab_anl_method_name.	Pick from valid values	Yes
Lab_receipt_date	Date Time			DateTime that sample was received at laboratory (in "MM/DD/YYYY HH:MM:SS" format for EDD).		Yes
Lab_receipt_Temp	Numeric			Receipt at lab.		Yes
Lab_receipt_Temp_Units	Text(15)			Units of measurement for the result. Controlled vocabulary, valid values deg C and deg F.		Yes
analysis_date	Date Time	PK		Date and time of sample analysis in "MM/DD/YYYY HH:MM:SS" format. May refer to either beginning or end of the analysis as required by EPA.		Yes
total_or_dissolved	Text(1)	PK	T	Must be either "D" for dissolved or filtered [metal] concentration, or "T" for everything else ("N" may also be used if Not Applicable).	"D" or "T" or "N"	Yes
test_type	Text(10)	PK	INITIAL	Type of test. Valid values include "Initial," "Reextract1," "Reextract2," "Reextract3," "Reanalysis," "Dilution1," "Dilution2," and "Dilution3."		Yes

**Table D-4 WSDOTTRSQC\_v1 (continued).**

Field Name	Data Type	Key	Default	Comment	Laboratory Notes	Required?
lab_matrix_code	Text(3)			Code that distinguishes between different types of sample matrix. For example, soil samples must be distinguished from groundwater samples, etc. See matrix valid value table in the appendix. The matrix of the sample as analyzed may be different from the matrix of the sample as retrieved (e.g., leachates), so this field is available at both the sample and test level.	"W" for water or "SE" for sediment	Yes
analysis_location	Text(2)	Y	FI	Must be either Field Instrument, Mobile Laboratory, or Fixed Laboratory	"Fixed Laboratory"	Specified Value
basis	Text(10)	Y	NA	Must be either "Wet" for wet_weight basis reporting, "Dry" for dry_weight basis reporting, "AFDW" for ash-free dry weight basis reporting, or "NA" for tests for which this distinction is not applicable. The EPA prefers that results are reported on the basis of dry weight where applicable.	"Wet," "Dry," "AFDW," or "NA"	Yes
container_id	Text(30)			May be used for bar coding purposes.		optional
dilution_factor	Numeric		1.0	Effective test dilution factor.	Default is no dilution "1.0"	Yes
prep_method	Text(20)			Laboratory sample preparation method name or description. A controlled vocabulary (i.e., see Prep_mthd_var valid values in the appendix). For metals, must be acid prep.	Required if separate prep method used than the analysis method	Conditionally Required
prep_date	Date Time			Beginning date and time of sample preparation in "MM/DD/YYYY HH:MM:SS" format.		Yes
leachate_method	Text(15)			Laboratory leachate generation method name or description. The method name should be sufficient to reflect operation of the laboratory (see analysis method discussion).	If conducting leaching method, this is required	Conditionally Required

**Table D-4 WSDOTTRSQC\_v1 (continued).**

Field Name	Data Type	Key	Default	Comment	Laboratory Notes	Required?
leachate_date	Date Time			Beginning date and time of leachate preparation in "MM/DD/YYYY HH:MM:SS" format.	If conducting leaching method, this is required	Conditionally Required
lab_name_code	Text(20)			Unique identifier of the laboratory as defined by the EPA. Controlled vocabulary; see lab valid value table in the appendix.	Value will be provided by WSDOT	Yes
qc_level	Text(10)			Describes QC level.		optional
lab_sample_id	Text(20)			Laboratory LIMS sample identifier. If necessary, a field sample may have more than one LIMS lab_sample_id (maximum one per each test event).		Yes
percent_moisture	Text(5)			Percent moisture of the sample portion used in this test; this value may vary from test to test for any sample. Numeric format is "NN.MM" (i.e., 70.1% could be reported as "70.1" but not as "70.1%").	Required if percent solids was measured on the sample – This field may change to percent solids in future versions	Conditionally Required
subsample_amount	Text(14)			Amount of sample used for test.		Yes
subsample_amount_unit	Text(15)			Unit of measurement for subsample amount. Controlled vocabulary; see Unit valid values table in appendix.		Yes
analyst_name	Text(30)			Name or initials of analyst.		Yes
instrument_id	Text(50)			Identifies instrument used for analysis.		optional
comment	Text (255)			Comments about the test as necessary.		optional
preservative	Text(20)			Sample preservative used.	Required if preservative deviated from QAPP-specified preservative	Conditionally Required
final_volume	Numeric			The final volume of the sample after sample preparation. Include all dilution factors.		Yes
final_volume_unit	Text(15)			The unit of measure that corresponds to the final_volume.		Yes
cas_rn	Text(15)	PK		Use values in analyte valid value table.		Yes

**Table D-4 WSDOTTRSQC\_v1 (continued).**

Field Name	Data Type	Key	Default	Comment	Laboratory Notes	Required?
chemical_name	Text(75)	Y		Use the name in the analyte valid value table.		Yes
result_value	Numeric			Analytical result reported at an appropriate number of significant digits. Report non_detects as the Method Detection Limit.		Yes
result_type_code	Text(10)	Y	TRG	Must be either "TRG" for a target or regular result, "TIC" for tentatively identified compounds, "SUR" for surrogates, "IS" for internal standards, or "SC" for spiked compounds.		Yes
reportable_result	Text(10)	Y	Yes	Must be either "Yes" for results that are considered to be reportable, or "No" for other results. This field has many purposes. For example, it can be used to distinguish between multiple results where a sample is retested after dilution. It can also be used to indicate which of the first or second column result should be considered primary. The proper value of this field in both of these two examples should be provided by the laboratory (only one result should be flagged as reportable).		Yes
lab_qualifiers	Text(10)			Qualifier assigned by the laboratory.		Yes
validator_qualifiers	Text(10)			Qualifier assigned by the validation firm.	Required if verification or validation uses different qualifier	Conditionally Required
interpreted_qualifiers	Text(10)			Qualifier assigned by the validation firm reason. This is a controlled vocabulary column; valid values can be found in the qualifiers table in appendix.	Must match lab or validator qualifier	Yes
method_detection_limit	Text(20)			Method Detection Limit.		Yes

**Table D-4 WSDOTTRSQC\_v1 (continued).**

Field Name	Data Type	Key	Default	Comment	Laboratory Notes	Required?
reporting_detection_limit	Numeric			Concentration level above which results can be quantified with confidence. It must reflect conditions such as dilution factors and moisture content. Required for all results for which such a limit is appropriate. Detection limit type must be populated. The reporting_detection_limit column must be reported as the sample-specific detection limit.		optional
Reporting Detection Limit Type	Text (9)			Type of detection limit reported.		optional
Practical quantitation_limit	Text(20)			The lowest level that can be reliably measured by routine operating conditions within specified limits of precision and accuracy.		Yes
result_unit	Text(15)			Units of measurement for the result. Controlled vocabulary; see Units valid value table in the appendix.		Yes
detection_limit_unit	Text(15)			Units of measurement for the detection limit(s). Controlled vocabulary; see Units valid value table in the appendix. This field is required if a reporting_detection_limit is reported.		Yes
result_comment	Text (255)			Result-specific comments.		optional
qc_original_conc	Numeric			The concentration of the analyte in the original (unspiked) sample. Might be required for spikes and spike duplicates (depending on user needs). Not necessary for surrogate compounds or LCS samples (where the original concentration is assumed to be zero).	Required if pertains to QC sample	Conditionally Required

**Table D-4 WSDOTTRSQC\_v1 (continued).**

Field Name	Data Type	Key	Default	Comment	Laboratory Notes	Required?
qc_spike_added	Numeric			The concentration of the analyte added to the original sample. Might be required for spikes, spike duplicates, surrogate compounds, LCS, and any spiked sample (depending on user needs).	Required if pertains to QC sample	Conditionally Required
qc_spike_measured	Numeric			The measured concentration of the analyte. Use zero for spiked compounds that were not detected in the sample. Might be required for spikes, spike duplicates, surrogate compounds, LCS, and any spiked sample (depending on user needs).	Required if pertains to QC sample	Conditionally Required
qc_spike_recovery	Numeric			The percent recovery calculated as specified by the laboratory QC program. Always required for spikes, spike duplicates, surrogate compounds, LCS, and any spiked sample. Report as percentage multiplied by 100 (e.g., report "120%" as "120").	Required if pertains to QC sample	Conditionally Required
qc_dup_original_conc	Numeric			The concentration of the analyte in the original (unspiked) sample. Might be required for spike or LCS duplicates only (depending on user needs). Not necessary for surrogate compounds or LCS samples (where the original concentration is assumed to be zero).	Required if pertains to QC sample	Conditionally Required
qc_dup_spike_added	Numeric			The concentration of the analyte added to the original sample. Might be required for spike or LCS duplicates, surrogate compounds, and any spiked and duplicated sample (depending on user needs). Use zero for spiked compounds that were not detected in the sample. Required for spikes, spike duplicates, surrogate compounds, LCS, and any spiked sample. Also complete the qc-spike-added field.	Required if pertains to QC sample	Conditionally Required

**Table D-4 WSDOTTRSQC\_v1 (continued).**

Field Name	Data Type	Key	Default	Comment	Laboratory Notes	Required?
qc_dup_spike_measured	Numeric			The measured concentration of the analyte in the duplicate. Use zero for spiked compounds that were not detected in the sample. Might be required for spike and LCS duplicates, surrogate compounds, and any other spiked and duplicated sample (depending on user needs). Also complete the qc-spike-measured field.	Required if pertains to QC sample	Conditionally Required
qc_dup_spike_recovery	Numeric			The duplicate percent recovery calculated as specified by the laboratory QC program. Always required for spike or LCS duplicates, surrogate compounds, and any other spiked and duplicated sample. Also complete the qc-spike-recovery field. Report as percentage multiplied by 100 (e.g., report "120%" as "120").	Required if pertains to QC sample	Conditionally Required
qc_rpd	Text(8)			The relative percent difference calculated as specified by the laboratory QC program. Required for duplicate samples as appropriate. Report as percentage multiplied by 100 (e.g., report "30%" as "30").	Required if pertains to QC sample	Conditionally Required
qc_spike_lcl	Text(8)			Lower control limit for spike recovery. Required for spikes, spike duplicates, surrogate compounds, LCS, and any spiked sample. Report as percentage multiplied by 100 (e.g., report "60%" as "60").	Required if pertains to QC sample	Conditionally Required
qc_spike_ucl	Text(8)			Upper control limit for spike recovery. Required for spikes, spike duplicates, surrogate compounds, LCS, and any spiked sample. Report as percentage multiplied by 100 (e.g., report "60%" as "60").	Required if pertains to QC sample	Conditionally Required
qc_rpd_cl	Text(8)			Relative percent difference control limit. Required for any duplicated sample. Report as percentage multiplied by 100 (e.g., report "25%" as "25").	Required if pertains to QC sample	Conditionally Required

**Table D-5 WSDOTBAT\_v1.**

Field Name	Data Type	Key	Default	Comment	Laboratory Notes	Required?
sys_sample_code	Text(40)	PK		Unique sample identifier. Each sample must have a unique value, including spikes and duplicates. Laboratory QC samples must also have unique identifiers. The laboratory and the EQUIS® Chemistry user have considerable flexibility in the methods they use to derive and assign unique sample identifiers, but uniqueness throughout the database is the only restriction enforced by EQUIS® Chemistry.	See TRSQC Sheet	Yes
lab_anl_method_name	Text(35)	PK		Laboratory analytical method name or description. A controlled vocabulary column; valid values can be found in the appendix in table ab_anl_method_name.	See TRSQC Sheet	Yes
analysis_date	Date Time	PK		Date and time of sample analysis in "MM/DD/YYYY HH:MM:SS" format. May refer to either beginning or end of the analysis as required by EPA.	See TRSQC Sheet	Yes
total_or_dissolved	Text(1)	PK	T	Must be either "D" for dissolved or filtered [metal] concentration, or "T" for everything else.	See TRSQC Sheet	Yes
test_type	Text(10)	PK	INITIAL	Type of test. Valid values include "Initial," "Reextract1," "Reextract2," "Reextract3," "Reanalysis," "Dilution1," "Dilution2," and "Dilution3."	See TRSQC Sheet	Yes
test_batch_type	Text(10)	PK		Lab batch type. Valid values include "Prep," "Analysis," and "Leach." This is a required field for all batches.		Yes
test_batch_id	Text(20)	Y		Unique identifier for all lab batches.		Yes